

TECHNOLOGY DEPT.

R

THE JOURNAL OF THE INSTITUTION OF PRODUCTION ENGINEERS

VOL. XXVIII

No. 11

November, 1949



Principal Contents :

BIRMINGHAM GRADUATE CONVENTION

SOME ASPECTS OF THE
INDUSTRIAL EMPLOYMENT OF THE BLIND

by Dr. L. G. FUCHS, A.I.P.E.

Published by THE INSTITUTION,
36, PORTMAN SQUARE, LONDON, W.1
All rights reserved.

Telephone :
WELbeck 6813/7.
PRICE 5/-

TRIEFUS

INDUSTRIAL DIAMONDS

For
Wheel dressing
Wire drawing
Drilling, engraving &
all mechanical purposes

*Diamond Boart
& Diamond Powder
(Graded and Purified)*

TRIEFUS & CO., LTD.

32-34 HOLBORN VIADUCT · LONDON · E.C.1

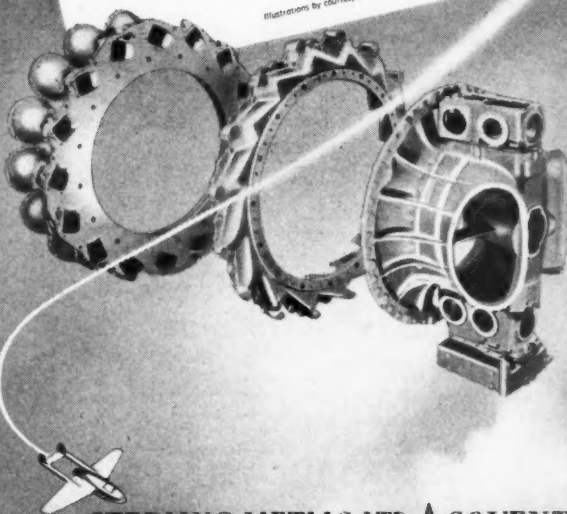
Phone: CENTRAL 9923-4 • Grams: TRIEFUS LONDON

NEW YORK · PARIS · TORONTO
SYDNEY · WELLINGTON
GEORGETOWN, B.G. · ANTWERP · RIO DE JANEIRO

ELEKTRON MAGNESIUM ALLOYS AND ALUMINIUM ALLOYS

*Used for all Major Castings
on the De Havilland 108
"Goblin Engine"*

Illustrations by courtesy of The De Havilland Engine Company Ltd



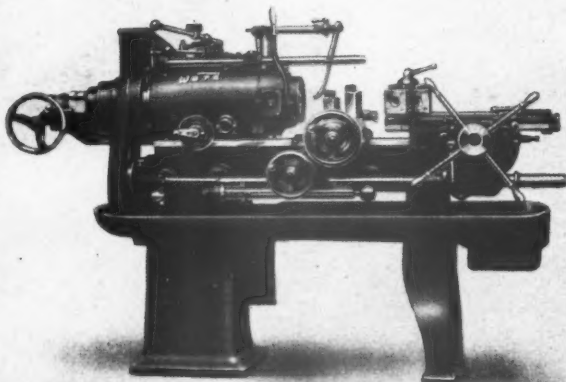
STERLING METALS LTD.  COVENTRY

*Telephone
Coventry 89031 (6 lines)
Telegrams
Stermet Phone Coventry*

CAPSTAN & TURRET LATHES



Ward



Nº 2A CAPSTAN LATHE

Height of Centres . 5½ in.	Range of spindle speeds 48 to 2041 r.p.m.
Dia. of hole through spindle 1½ in.	Max. dia. that will swing over bed . 11½ in.
Dia. that auto chuck will take up to . 1½ in.	Swing over steel cross slide . . 6½ in.
No. of spindle speeds forward and reverse 6	

For belt or independent motor drive.

Particulars of our full range of machines on request

H.W.WARD & CO. LTD., DALE ROAD, BIRMINGHAM, 29

*Get Geared up
on the*
**SUNDERLAND
GEAR PLANER**



FOR SPUR, SPIRAL, HELICAL & DOUBLE HELICAL GEARS

J PARKINSON & SON
(SHIPLEY) LTD

SHIPLEY

YORKSHIRE

TEL. 53231

HARRIS
Ground Thread
Taps
produced to one
unvarying standard
-the best

HARRIS
1/2
A.N.

JOHN HARRIS TOOLS LTD. • WARWICK • phone 741 (4 lines)



Each Kardex Record is individually designed to meet your particular needs

KARDEX is the simplest, speediest, easiest way of keeping records and maintaining effective control. Visible titling gives you faster reference, the pocket system enables you to group related records, and the brightly-coloured signals automatically spotlight matters requiring attention. Each Kardex scheme is individually designed by specialists who have at their command Remington Rand's long experience of the record problems of almost every trade and profession.

★ Write for new Illustrated Folder

Remington Rand



THE KARDEX POCKET is the perfected result of over 30 years of experience, and the recognised standard of efficiency and durability wherever visible records are used. In it you may group several related records under one title, so that decisions are based on *all* the relevant facts. On its visible margin signals summarize the salient points of each record.

REMINGTON RAND LTD. (Dept. 31), 1 NEW OXFORD ST., LONDON, W.C.1. Tel: CHAncery 8888

— VISIT STAND G.I. 37 (Ground Floor) Business Efficiency Exhibition, Olympia, November 9th to 19th —

Touch control starting and stopping by hydraulically assisted clutch engagement.



Heavy rectangular dynapoise overarm with built-in vibration damper for troublesome jobs.



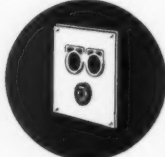
Independent, directional controls—longitudinal, cross and vertical.



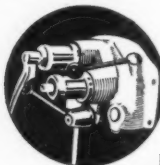
Power operated, single lever controlled, speed and feed dial changes at front and rear working positions.



Built-in push button station and electrical controls, with automatic cut out of motor when electrical compartment doors are opened.

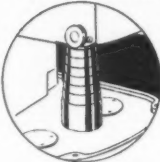


Automatic disengagement of hand cranks when released. Pull-out quick-adjusting micrometer dials.



Duplicate set of control levers at rear working position.

Vertical screw enclosed and automatically lubricated.



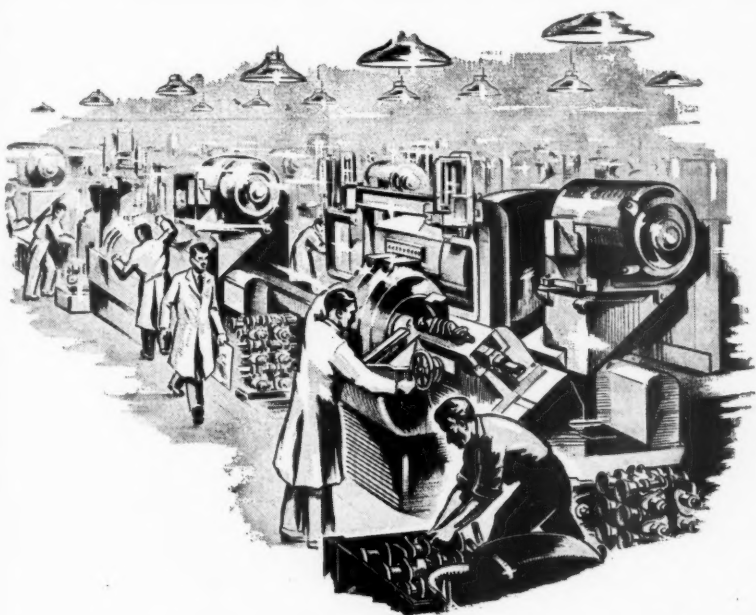
8 BIG FEATURES OF THE CINCINNATI DIAL TYPE MILLING MACHINE

Here is an up to the minute development of the already famous Cincinnati Dial Type Milling Machine, which is available in three styles—Plain, Universal and Vertical; three sizes—2, 3 & 4 and in two speed ranges. These new machines offer versatility, convenience, ease and safety of operation coupled with outstanding cutting ability. Some of the design features leading to this performance are highlighted here, showing how each, in itself, makes an important contribution to the complete picture—the Cincinnati Dial Type Milling Machine.

CINCINNATI MILLING MACHINES LIMITED, TYBURN, BIRMINGHAM, 24

Sales Representatives for Great Britain and Northern Ireland: Charles Churchill & Co. Ltd., Coventry Road, South Yardley, Birmingham, 25.

Sales Representatives for Eire: Booth Bros. Ltd., Dublin.



Thank Wickman for Wimet !

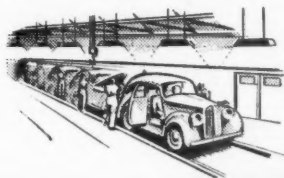
Production engineers beset with the problems of increasing production per man-hour and lowering costs usually find the solution in "Wimet" carbide tooling.

The automotive industry, with a fine record of productivity in the export drive, is one of the largest users of "Wimet" tools for turning, planing, milling, boring, and a host of other applications.

When correctly applied, "Wimet" tools increase output and provide longer tool life in the

largest and most up-to-date plants or in the small workshop.

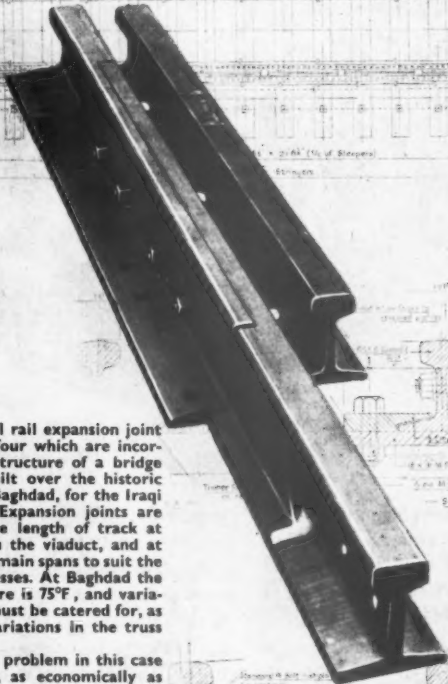
An interesting booklet on the correct application of "Wimet" tools is available and will help you to obtain the best results. Write to the Wickman Technical Publications Department for a copy.



A. C. WICKMAN LTD • COVENTRY • ENGLAND
 LONDON • BRISTOL • BIRMINGHAM • MANCHESTER
 LEEDS • GLASGOW • NEWCASTLE • BELFAST

Wimet

Why a STEEL CASTING ?...



... this cast steel rail expansion joint is one of ninety-four which are incorporated in the structure of a bridge that is being built over the historic River Tigris, at Baghdad, for the Iraqi State Railways. Expansion joints are interposed in the length of track at 150-ft. centres on the viaduct, and at distances on the main spans to suit the length of the trusses. At Baghdad the mean temperature is 75°F, and variations of $\pm 60^\circ\text{F}$ must be catered for, as well as stress variations in the truss steelwork itself.

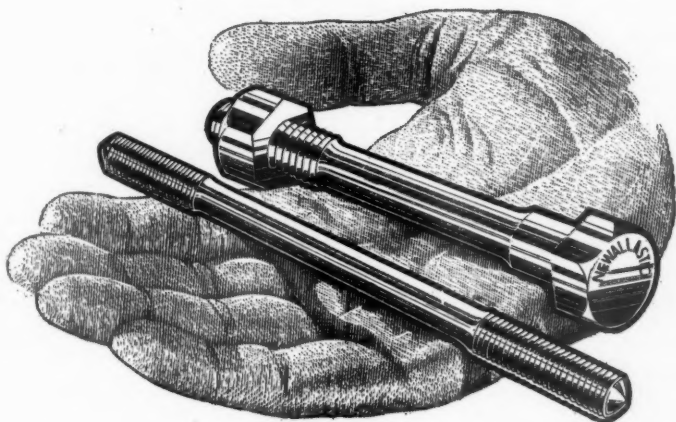
The designer's problem in this case was to produce, as economically as possible, parts which at their ends would "fish up" exactly to the adjoining rolled rails and elsewhere would provide the differences in section that were needed. Manipulation of rolled rails was obviously impossible. By producing these parts as steel castings, the design details were reproduced with only a fraction of the machining which would have been necessary had the parts been produced by any other means, representing a saving in cost of at least 50 per cent.

You can make wider use of steel castings...

The Secretariat, British Steel Founders' Association, 301 Glossop Road, Sheffield.

BSFA
STEEL CASTINGS

Unique



"Newallastic" bolts and studs have qualities which are absolutely unique. They have been tested by every known device, and have been proved to be stronger and more resistant to fatigue than bolts or studs made by the usual method.

G. P. Newall & Co., Ltd.

POSSILPARK GLASGOW · N

PRODUCTION INCREASED

up to

20%

when you install the

'AIRTRIP'

for safe, instant control of interlocking guards—a standard installation, manufactured by

PRESS GUARDS LTD

and incorporating MAXAM Air Valves and Cylinders. Easily fitted, it gives speed and efficiency of working—increased output is assured.



Photograph by courtesy of Standard Telephones and Cables Limited

The "AIRTRIP" can be used on all presses up to 100 tons capacity. Operation is simple and infallible—depression of the pedal closes the guard and at the same time actuates the MAXAM Valve, which passes air to the MAXAM Air Cylinder to engage the clutch. This arrangement frees both hands of the operator and allows much

lighter operation of the foot pedal. Also, since there can be no attempt to engage the clutch until the guard is fully closed, failure of the clutch locking gear is completely avoided.

The "AIRTRIP" is designed to comply with H.M. Factory Departments Recommendations. Patents pending.



PNEUMATIC EQUIPMENT

MAXAM Air Control Valves are available for many purposes, and for hand, foot, cam, electrical, mechanical or pressure actuation. MAXAM Air Cylinders range from $\frac{1}{4}$ " to 20" dia. bores x any stroke.

ENQUIRIES FOR 'AIRTRIP'

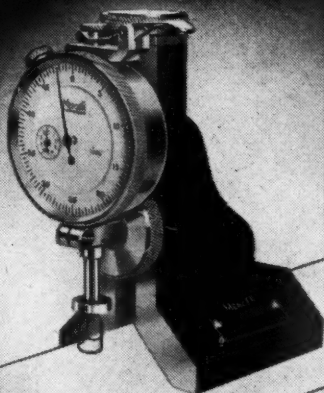
to Messrs. PRESS GUARDS LTD., 372-8 Farm Street, Hockley, Birmingham.

ENQUIRIES FOR MAXAM

AIR VALVES AND CYLINDERS to THE CLIMAX ROCK DRILL & ENGINEERING WORKS LTD., 4 Broad Street Place, London, E.C.2.

THE MERCER BORING BAR GAUGE

FOR SPEEDY SETTING OF BORING TOOLS



The Gauge is designed for the rapid setting of cutting tools in boring bars; it also has many other tool setting and related applications.

The instrument has a capacity of 0-3½" and can be fitted with dial indicators graduated in '0005" or '0001" according to requirements. The dial indicator has a travel of ½" allowing the instrument to be used over a wide range without the necessity of resetting; furthermore, provision is made for traversing the indicator over the full capacity of 3½" by means of a central lead screw and nut. A lifting lever is fitted as standard to the instrument which is supplied in a polished wood case.

Write for details of this and other new models to:—

THOMAS MERCER LIMITED

GAUGE DIVISION, EYWOOD RD., ST. ALBANS

Telephone: St. Albans 5313 4/5

MILLS

BRIGHT STEEL SECTIONS

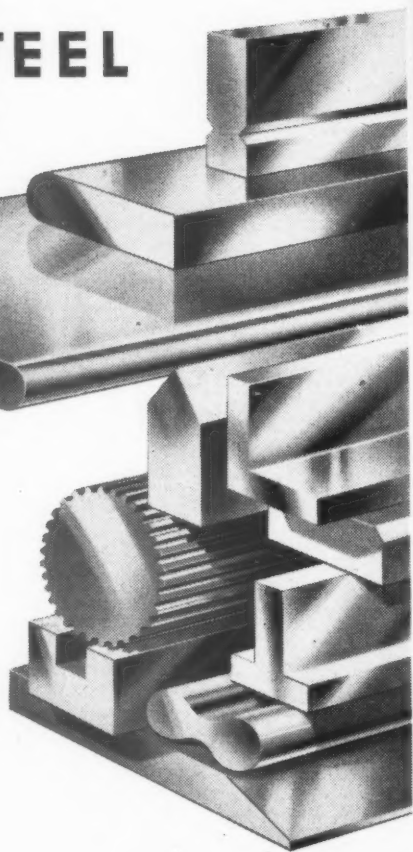
TOOLS AVAILABLE
FOR OVER 1,600
SPECIAL SHAPES

All our special shaped bars are bright smooth finish, accurate to drawing, and to required limits.

Eliminate the need for machining from the solid, save steel, and help to speed up production.

Sections can be produced to customers' requirements in approved quantities.

Please ask for our Special Sections Catalogue.



EXORS OF JAMES MILLS LTD

BREDBURY STEEL WORKS AND ROLLING MILLS

WOODLEY · Near STOCKPORT · ENGLAND

TELEPHONE: WOODLEY 2231 (10 LINES)

TELEGRAMS: "MILLS" PHONE WOODLEY

B.S.A. - NAMCO

BRITISH MADE

DIEHEADS



Simple in construction and easy to adjust.
Hardened and ground throughout. Circular
type chasers ensure extreme accuracy of
thread form and long life. Made under
licence in Great Britain.

Catalogue on request.

Manufactured by

B.S.A. TOOLS LTD. · BIRMINGHAM · ENGLAND

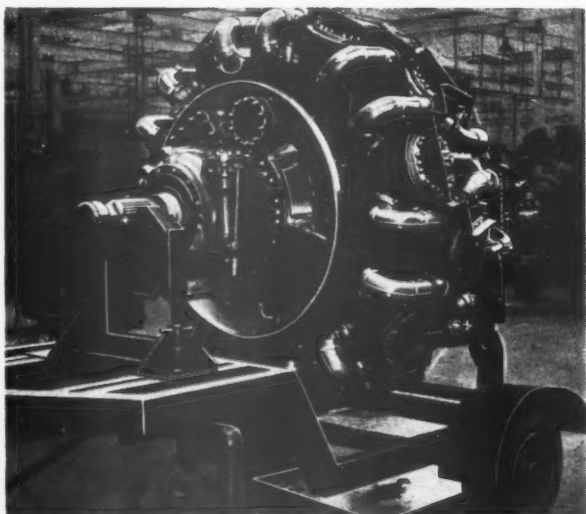
AGENTS THROUGHOUT THE WORLD

Sole Agents in Great Britain

BURTON, GRIFFITHS & CO. LTD., Small Tools Division, MONTGOMERY ST BIRMINGHAM 11



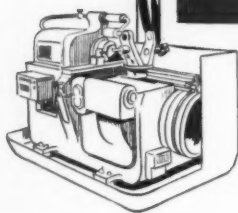
Achievements in British Engineering



*Reproduced by courtesy of
The Bristol Aeroplane Company, Ltd., Filton, Bristol.*

BRISTOL HERCULES SLEEVE VALVE AERO ENGINE

FRAPOL NEAT CUTTING OIL
is used in the production of this
notable example of British Engineering



Quality Products
Metal Cutting Oils
Drawing Compounds
Rust Preventatives
Lubricating & Processing
Oils for all Industries
Heat Treatment Oils &
Salts · Solid Carburizers
Industrial Cleaners
Mechanical Leathers

**EDGAR VAUGHAN
& CO., LTD.
BIRMINGHAM, 4
ENGLAND**





Progressive Engineers PLEASE NOTE

Catalogues
MAXICUT
Lathes and
Gear Shapers
gladly sent on
request.

MAXICUT machine tools have been designed to obtain the highest standard of production by the most economical methods and as a result of the maker's constant attention to the needs of modern production MAXICUT machine tools are, today, leaders in their respective fields.

TO INSTAL 'MAXICUT' IS PROGRESS!

MAXICUT

PRODUCTION MACHINE TOOLS



DRUMMOND BROTHERS LTD.
GUILDFORD, Eng.

Sales and Service for the British Isles

DRUMMOND-ASQUITH (SALES) LTD.

KING EDWARD HOUSE · NEW STREET · BIRMINGHAM

'Phone: Midland 3431-2-3

Grams: Maxishape, B'ham

Also at LONDON and GLASGOW

A SUPREME



ACHIEVEMENT



the
Matrix

No. 50 Optical
Jig Boring
Machine

*Combining more ideal features in the one superbly
designed machine than any other jig borer yet produced.
We shall be happy to send descriptive literature*

Coventry Gauge

A TOOL CO. LTD. COVENTRY, CT. BRITAIN

The Council of the Institution

1949-50

President

DR. H. SCHOFIELD, C.B.E.

President-Elect

MAJOR-GENERAL K. C. APPEYARD, C.B.E., T.D., D.L., J.P.

Chairman of Council

J. E. HILL

Vice-Chairman

Walter C. Puckey

Past Presidents

Sir George E. Bailey, C.B.E.

The Rt. Hon. Lord Sempill, A.F.C.

The Rt. Hon. Viscount Nuffield, G.B.E.

J. D. Scaife

Vice-Presidents

T. Fraser, C.B.E.

J. H. Bingham,

E. W. Hancock, M.B.E.

J. A. Hannay

Section Presidents

H. Burke *Birmingham*

Col. C. G. Warren-Boulton..... *Bombay*

T. R. Gupta *Calcutta*

A. F. Pool..... *Cornwall*

B. C. Harrison *Coventry*

J. Lomax *Dundee*

H. H. Dawson *E. Counties*

J. L. Bennet..... *Edinburgh*

H. Gardner..... *Glasgow*

H. Nutton..... *Halifax*

J. Wombwell, M.B.E..... *Leicester*

B. A. Williams, O.B.E..... *Liverpool*

W. Core..... *London*

R. L. Paice *Luton*

W. Symes *Manchester*

L. Walker *N. Eastern*

R. Cairns..... *N. Ireland*

E. Paton..... *New Zealand*

J. H. Bingham..... *Nottingham*

T. A. Westall..... *Preston*

L. R. Evans..... *Sheffield*

C. A. Clarke *Southern*

W. J. Vaughan..... *S. Wales & Mon.*

R. S. Brown..... *Western*

A. J. Aiers..... *Wolverhampton*

J. Horn *Yorkshire*

Additional Section Representatives

F. Bernard White..... *Birmingham*

F. C. White..... *Birmingham*

H. Eckersley *Coventry*

J. Blakiston *Halifax*

H. W. Bowen, O.B.E..... *London*

F. P. Laurens, O.B.E..... *London*

R. K. Allan *Luton*

F. W. Cranmer..... *Manchester*

M. Seaman..... *Manchester*

J. F. Gibbons..... *N. Eastern*

A. S. Johnstone..... *Nottingham*

H. Kirkman *Preston*

G. R. Pryor..... *Sheffield*

J. E. Attwood..... *Western*

H. Tomlinson *Wolverhampton*

W. J. Marshall..... *Wolverhampton*

T. E. Phythian, M.B.E. *Yorkshire*

Chairmen of Standing Committees

J. E. Baty

E. P. Edwards

F. H. Perkins

A. L. Stuchbery

Elected Members

F. Bloor, E. D. Broome, R. M. Buckle, B. H. Dyson, R. C. Fenton,

H. G. Gregory, E. J. H. Jones, M.B.E., R. Kirchner, Prof. T. U. Matthew,

H. J. Swift, O.B.E. M. H. Taylor, S. Wright

Australian Sub-Council

1949

President

E. C. PARKINSON

Chairman

E. L. OLFEN

Vice-Chairman

E. B. Richardson

Elected Members

H. le Cheminant W. G. Davis

J. Finlay F. Glover

S. D. McPhee C. Pullen

J. M. Steer J. E. Strick

South African Sub-Council

1949/50

President

A. C. WOTHERSPOON

Vice-President

J. RENWICK

Past Presidents

A. B. Anderson

L. H. L. Badham

J. Henry

D. Lion-Cachet

Elected Members

R. H. Arbuckle

W. Caldwell

J. Pickup

E. G. Fox

W. Gillespie

G. Godfrey

D. A. Petrie

W. Starr

H. H. Waters

Director and General Secretary of the Institution

Major C. B. Thorne, M.C.

Education Officer: T. B. Worth

Section Honorary Secretaries

Birmingham	A. J. Mansell, 204, Alcester Road South, Birmingham, 14.
Bombay	E. H. Y. Burden, Machine Tools (India) Ltd., Imperial Chambers, Wilson Road, Ballard Estate, P.O. Box No. 522, Bombay, 1.
Calcutta	J. Warren-Boulton, Machine Tools (India) Ltd., Stephen House, Dalhousie Square, Calcutta.
Cornwall	F. W. Spencer, "Pembroke," Phillack, Hayle, Cornwall.
Coventry	A. Hill, 382, Ansty Road, Coventry.
Derby Sub-Section .	A. Short, 9, Laburnum Grove, Kingsway, Derby.
Dundee	A. H. Webster, 8, Kinnordy Terrace, Craigiebank, Dundee, Angus.
Eastern Counties .	L. A. Childs, Crane Ltd., Nacton Road, Ipswich.
Edinburgh	P. H. Lee, 39, Corstorphine Bank Drive, Edinburgh, 12.
Glasgow	W. P. Kirkwood, "Morar," Sandfield Avenue, Milngavie, Dumbartonshire.
Halifax	Miss N. E. Bottom (acting), Hopkinsons, Ltd., Huddersfield.
Leicester and District	C. F. Gazard, 27, Stretton Road, Leicester.
Lincoln Sub-Section	E. E. Ingleton, "Glenroy," Lincoln Road, North Hykeham, Lincoln.
Liverpool	O. Blenkinsop, 119, North Barcombe Road, Childwall, Liverpool, 16.
London	H. W. Townsend, Philips Electrical Ltd., New Road, Mitcham Junction, Surrey.
Luton and Bedford .	R. M. Buckle, 238, Cutenhoe Road, Luton, Beds.
Manchester	R. S. Clark, 13, Fownhope Road, Sale, Cheshire.
Melbourne (Victoria, Australia)	C. Pullen, The Institution of Production Engineers, 3rd Floor, 18, Queen Street, Melbourne, C.1.
New Zealand	S. Mc L. Wallace, 21, Burwood Crescent, Remuera, Auckland.
North Eastern . .	H. B. Topham, C. A. Parsons & Co., Ltd., Heaton Works, Newcastle-upon-Tyne, 6.
Northern Ireland .	W. G. Wyman, "Linden Lea," Cultra, Co. Down.
Nottingham	C. N. T. Manfull, Chellaston House, Thurgarton Street, Nottingham.
Preston	F. M. Kemp, Clayton, Goodfellow & Co., Ltd., Atlas Iron Works, Blackburn, Lancs.
Sheffield	E. Levesley, 259, School Road, Sheffield, 10.
Shrewsbury Sub-Section	R. O. L. Cadman, 5, Perseverance Terrace, East Road, Ketley Bank, Oakengates, Salop.
South Africa	The Secretaries, Institution of Production Engineers, Barclays Bank Buildings, Corner Commissioner and Harrison Streets, Johannesburg.
Southern	S. Coates, 51, Westbury Road, Regent's Park, Shirley, Southampton.
South Wales and Monmouthshire	S. T. O. Davies, 4, St. Cadoc Road, Heath, Cardiff.
Sydney (New South Wales)	J. M. Steer, G.P.O. Box 1665, Sydney.
Western	A. Eustace, 19, Ferndale Road, Northville, Bristol, 7.
West Wales Sub-Section . .	H. P. Sanderson, I.C.I. Ltd., (Metals Division) Waunarlwydd, near Swansea.
Wolverhampton . .	W. J. Marshall, Moston Park, Lee Brockhurst, Salop.
Yorkshire	J. L. Townend, 26, Moor Allerton Drive, Street Lane, Leeds, 7.

Graduate Section Honorary Secretaries

Birmingham	J. Thompson, 113, Queens Road, Yardley, Birmingham, 26.
Coventry	S. Hey, 112, Moseley Avenue, Coventry.
Halifax	T. Marsden, 6, Kell Lane, Stump Cross, Halifax.
London	R. T. Mustard, 47, King's Road, Woodham, Weybridge, Surrey.
Luton	C. S. Brewer, 144, Hart Lane, Luton.
Manchester	W.R.Matley, 58, Heyscroft Rd, Withington, Manchester, 20.
North Eastern . .	G. D. Robson, 86, Dryden Road, Low Fell, Gateshead.
Wolverhampton . .	R. W. Tomkys, 30, Church Road, Bradmore, Wolverhampton, Staffs.
Yorkshire	S. Metcalfe, "Marstan," 20, Heath Mount, Leeds, 11.

PERSONAL MESSAGE FROM THE CHAIRMAN AND THE VICE-CHAIRMAN OF COUNCIL

Members will recall that when Major Thorne accepted an invitation from the Uxbridge Conservative Association to be their prospective Candidate at the General Election, he submitted his resignation to the Institution. Council, while accepting this resignation, at that time asked Major Thorne if he would be prepared to continue in his present office until the end of 1949, and this he willingly agreed to do.

At a Council meeting held on 20th October, 1949, this matter was reviewed, and it was felt that in view of the tremendous amount of forward movement within the Institution and the importance of having continuity of executive direction at such a time, it would be desirable to ask Major Thorne if he would continue in office until at least the General Election, particularly having regard to the Prime Minister's recent statement that the General Election would, at the earliest, not take place until some time next year.

Major Thorne has agreed to continue on this basis, and any further action with regard to his appointment will depend entirely on whether he is elected or otherwise at the Uxbridge election. We feel it is important in the interests of continuity that all members should be aware of the precise situation in relation to our Chief Executive Officer, so that they may be assured in the meantime of a continuation of the services he and Headquarters staff have rendered to the Institution over the past five years.

J. E. Hill, Chairman of Council.

Walter C. Puckey, Vice-Chairman of Council.

20th October, 1949.

INSTITUTION NOTES

November, 1949

ANGLO-AMERICAN PRODUCTIVITY TEAM

Two members of the Institution, Mr. W. Torkington, A.M.I.P.E., and Mr. L. de Gebert, Int.A.M.I.P.E. are among the thirteen members of the Anglo-American Productivity Team representing the British Internal Combustion Engineering Industry, at present touring the United States. The team are studying factory administration, organisation, layout, methods and operating conditions in American Internal Combustion Engine factories, and will leave the United States via New York on 24th November.

SOCIAL PROBLEMS IN INDUSTRIAL ORGANISATIONS

Mr. B. H. Dyson, M.I.P.E., F.I.I.A., as the representative of the Institution of Production Engineers on the Overseas Relations Co-ordinating Committee of the British Institute of Management, attended the Third National Conference on Social Problems in Industrial Organisations held at Royaumont, near Paris, from June 3rd-6th, 1949.

Ten countries were represented at the Conference, and the subject chosen for the papers delivered by the delegates was "The Factors Which Contribute to Industrial Peace". A copy of Mr. Dyson's report and a set of the Conference Papers (in English) may be borrowed from the Institution's Library at 36, Portman Square, W.1.

TECHNICAL APPOINTMENTS: MEDWAY TECHNICAL COLLEGE

A Lecturer-Instructor is required to teach Machine Shop Technology and Practice up to the standard of Final City & Guilds Certificate in Machine Shop Engineering, and to teach Production Engineering subjects in the Higher National Certificate Course. The salary will be in accordance with the Burnham Scale, and the starting position will be dependent upon industrial experience and war service, for which up to twelve increments may be allowed. Sound industrial experience is essential.

Application should be made by letter to the Principal, Medway Technical College, Gillingham, giving very full details of industrial training and experience, including the names of employing firms and duration of employment. Two testimonials and two references should be included.

**S.E. LONDON
TECHNICAL COLLEGE**

A Senior Assistant Teacher of Production Engineering subjects to Higher National Certificate Standard is required in the Department of Mechanical Engineering.

Applicants should possess an engineering degree and/or be corporate members of either the Institution of Mechanical Engineers or the Institution of Production Engineers, and have good industrial and teaching experience.

The salary will be in accordance with the Burnham Scale, plus London Allowance, and where applicable, additions for graduate qualifications and training.

Further particulars and application form (stamped addressed foolscap envelope necessary) may be obtained from The Secretary at the College, Lewisham Way, S.E.4.

**BRITISH
STANDARDS**

The following Standards have recently been issued and are obtainable from the British Standards Institution, 28, Victoria Street, Westminster, S.W.1, price 2/6 each, post free :

1571 : 1949 Acceptance Tests for Positive-displacement Compressors and Exhausters.

I.P.E. Representative on appropriate B.S.I. Committee :
Mr. J. E. Baty, M.I.P.E.

1168 : 1949 Diamond Dies for Wire Drawing—Non-reinforced.

I.P.E. Representative on appropriate B.S.I. Committee :
Mr. J. E. Baty, M.I.P.E.

**BOOKS
RECEIVED**

"Office Organisation and Method", by G. Mills and O. Standingford. Sir Isaac Pitman & Sons, Ltd., London. Price 18/- net.

"The New Foremanship" (Vol. 2), by F. Burns Morton. Chapman & Hall, London. Price 12/6 net.

**ISSUE OF JOURNAL
TO NEW MEMBERS**

Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

IMPORTANT

In order that the Journal may be despatched on time, it is essential that copy should reach the Head Office of the Institution not later than 40 days prior to the date of issue, which is the first of each month.

NEWS OF MEMBERS

Mr. R. A. Barker, A.M.I.P.E., has been appointed a Director of Cecil Bentham, Ltd.

Dr. W. Bondi, M.I.Mech.E., M.I.P.E., who is a Director of British Oil Engines (Export) Ltd., has joined the Board of Associated British Engineering Ltd.

Mr. Gilbert Burton, A.M.I.P.E., has been appointed Process Engineer to Bruce Peebles & Co., Ltd., East Pilton Works, Edinburgh, 5.

Mr. G. A. Cleary, A.M.I.P.E., is now Works Manager of Long-close Engineering Co. Ltd., Leeds.

Mr. G. A. Daniell, A.M.I.P.E., formerly Chief Production Engineer of Simmonds Aeroccessories Ltd., Treforest, Cardiff, has been appointed Production Engineer to Arthur Berton, Ltd.

Mr. W. Ireland, M.I.P.E., is now General Manager of the Anglesey Instrument & Clock Co., Holyhead.

Mr. N. Jackson, Grad.I.P.E., has been appointed Assistant Lecturer in Engineering Mathematics and Drawing at the Richmond (Surrey) Technical Institute and School of Art. This appointment has necessitated Mr. Jackson's resignation from the Chairmanship of the Halifax Graduate Section and he has transferred to the London Graduate Section.

Mr. H. Kirk, A.M.I.P.E., is now Works Manager of The British C.E.C.A. Co. Ltd., Frindsbury, near Rochester.

Mr. V. P. Lashwood, A.M.I.P.E., is shortly taking up an appointment with Urwick, Orr & Partners, Ltd., as a Resident Consultant in the Production Division.

Mr. J. D. Rowe, A.M.I.P.E., is now Works Superintendent at Negretti & Zambra's new factory at Aylesbury, Bucks.

Mr. J. Loudon, A.M.I.P.E., A.M.I.W.M., M.I.E.D., is now Assembly Superintendent to Hoover (Electric Motors) Ltd., Cambuslang, Lanarkshire. He has also accepted a part-time lecturer's post at the School of Engineering, Burnbank, organised by the Lanarkshire County Council Education Committee, and has been granted a scholarship by the Institution of Works Managers to attend Cheshunt College, Cambridge, from October to December, 1949, in recognition of his success in obtaining second place in the Institution of Works Managers' 1949 Annual Competition.

Mr. E. H. Mather, Int.A.M.I.P.E., A.M.I.Mech.E., is now Assistant Works Manager to Hughes Bros. (Derbyshire Granite) Ltd., Buxton.

Mr. S. M. Maude, Grad.I.P.E., is now Production Engineer to the Burnley Group of Joseph Lucas, Ltd.

Major E. J. Parker, Int.A.M.I.P.E., is now Assistant Engineer (Production Division) at the Head Office of the British Aluminium Co.

Mr. G. W. Robinson, A.M.I.P.E., has been appointed Chief Draughtsman of Turbine Gears Ltd., Stockport.

Mr. Jack Rook, Grad.I.P.E., has been appointed an Investigator in the Machine Tool Section of the Production Engineering Research Association.

Mr. T. G. Sevier, A.M.I.P.E., has been appointed Works Manager of Andrews Bros. (Bristol) Ltd., Weston-super-Mare, Somerset.

Mr. W. Simpson, I.O.S., A.M.I.P.E., is now an Advisory Officer to the Production Efficiency Service of the Board of Trade, Belfast.

Mr. W. A. Smyth, M.I.P.E., has been elected a Director of W. G. Bagnall, Ltd., Castle Engine Works, Stafford. This is in addition to his present appointment of Director and General Manager of Henry Meadows, Ltd., Wolverhampton.

Mr. T. G. Swain, A.M.I.P.E., is now Works Manager, Charlwood Works, of British Manufactured Bearings Co. Ltd., Crawley, Sussex.

Mr. C. H. Taylor-Cook, A.M.I.P.E. has been appointed Vice-Principal of the Royal Aircraft Establishment Technical College at Farnborough.

Mr. Herbert Unsworth, A.M.I.P.E., has been appointed General Manipulation and Production Manager to Accles & Pollock, Ltd., Oldbury.

Mr. Horace W. White, A.M.I.Mech.E., A.M.I.P.E., has set up his own business and intends to specialise in the design and development of non-standard automatic machinery.

**VISITOR
FROM ABROAD**

Mr. Adrian Ashton Associate Editor of the "Australasian Engineer", is visiting the United Kingdom as the guest of the British Council and has paid a visit to the Institution Headquarters.

OBITUARY

The Institution has learned with deep regret of the deaths of the following members :

- Mr. Harry Denham, M.I.P.E., of Halifax Section.
- Mr. Herbert M. Brack, M.I.P.E., of Manchester Section.
- Mr. G. E. Goodwin, M.I.P.E., of Birmingham Section.
- Mr. N. Endacott, M.I.P.E., of London Section.
- Mr. W. H. Bryce, Int.A.M.I.P.E., of Manchester Section.
- Mr. J. Graham Scott, Int. A.M.I.P.E., of Coventry Section.

Members will be grieved to learn of the passing of Dr. Georg Schlesinger on 6th October. As this information reached the Institution at the time of going to press, a fuller appreciation will appear in the December Journal.

ERRATA

It is regretted that the following errors appeared in the paper, "The Generation of Fine Finishes by Machining Techniques," published in the October, 1949, Journal :

- p. 495, line 9 : for "if" read "of".
- p. 496, Fig. 1 : for "Surface Finish Measuring" read "Variation of Surface Texture for Given Degrees of Finish".
- p. 508, Fig. 8 : for "Nicked Broach Measuring" read "Nicked Broach in Operation".
- p. 520, Fig. 21 : "R = 0.020 in." should be transposed with "R = 0.005 in.", so that the top curve refers to the smaller radius.

SECTION MEETINGS

The following meetings have been arranged to take place in November and December. Where full details are not given, these have not been received at the time of going to press.

November

- 2nd NOTTINGHAM SECTION. A lecture on "Mechanised Mining" illustrated by sound films, will be given by Mr. J. A. Rogers at the Victoria Station Hotel, Milton Street, Nottingham, at 7.0 p.m.
- 2nd PRESTON SECTION. A lecture on "The Production Engineer—His Education and Training," will be given by Mr. T. B. Worth, Education Officer to the Institution, at the Harris Institute, Corporation Street, Preston, at 7.15 p.m.

November—cont.

- 2nd **WOLVERHAMPTON SECTION.** A lecture on "The Corby Iron & Steel Works of Stewarts & Lloyds," will be given by Mr. E. A. Taylor, M.Sc., at the West Midland Gas Board Demonstration Room, Clarence Street, Wolverhampton, at 7.0 p.m.
- 3rd **GLASGOW SECTION.** A Discussion on "Production Problems," will be given by Messrs T. Green, L. Brown and J. Menzies, at the Institution of Engineers and Shipbuilders, 39 Elmbank Crescent, Glasgow, C.2, at 8.0 p.m.
- 4th **WEST WALES SUB-SECTION.** An "Industrial Digest" evening has been arranged at the Y.M.C.A., St. Helen's Road, Swansea, commencing at 7.30 p.m.
- 7th **HALIFAX SECTION.** A lecture on "Efficient Production Methods Applied to Iron Founding," will be given by Mr. G. W. Nicholls, A.M.I.P.E., M.I.B.F., at Whiteley's Cafe, Westgate, Huddersfield, at 7.15 p.m.
- 7th **MANCHESTER GRADUATE SECTION.** A lecture on "Mechanised Foundries" will be given by Mr. Fox, at the Reynolds Hall, College of Technology, Manchester, at 7.15 p.m. This will be followed by a works visit on Saturday, 12th November, to a mechanised foundry.
- 7th **YORKSHIRE SECTION.** A lecture on "Metal Spraying," will be given by a representative of the Yorkshire Metal Sprayers Ltd., at the Hotel Metropole, King Street, Leeds, 1, at 7.0 p.m.
- 8th **BIRMINGHAM GRADUATE SECTION.** A lecture on "Some Aspects of the Operation of Production Control" will be given by Mr. B. E. Stokes, Grad. I.P.E., at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3., at 7.0 p.m.
- 8th **WOLVERHAMPTON GRADUATE SECTION.** A lecture on "Powder Metallurgy," will be given by Mr. H. W. Greenwood, M.Inst.Met., at the West Midland Gas Board Demonstration Room, Darlington Street, Wolverhampton, at 7.15 p.m.
- 9th **WESTERN SECTION.** A lecture on "Incentives for Production," will be given by Mr. C. L. Taylor, A.M.I.P.E., at the Concert Hall, Westinghouse Brake & Signal Co., Ltd., Chippenham, at 7.30 p.m.

November—cont.

- 10th **MANCHESTER SECTION.** A lecture on "Gear Shaving," will be given by Mr. B. F. Bregi at the Engineers' Club, Manchester, at 7.15 p.m.
- 11th **COVENTRY SECTION.** A lecture on "Industrial Maintenance of Machines," by Mr. R. M. Buckle, M.I.P.E., at the Greyfriars Rooms, Geisha Cafe, Hertford Street, Coventry, at 7.0 p.m.
- 12th **MANCHESTER GRADUATE SECTION.** A visit has been arranged to Howard & Bullough Ltd., Globe Works, Accrington, Lancs., commencing at 10.0 a.m.
- 12th **YORKSHIRE GRADUATE SECTION.** A lecture on "Graduate Status—Its Responsibilities and Implications" will be given by Mr. T. B. Worth, Education Officer to the Institution, at the Great Northern Station Hotel, Leeds, at 2.30 p.m.
- 14th **SHEFFIELD SECTION.** A lecture on "An Innovation in the Production of Cutlery Blanks," will be given by Mr. F. R. Francis, at the Royal Victoria Station Hotel, Sheffield, at 6.30 p.m.
- 15th **DUNDEE SECTION.** A lecture on "Motion Study," will be given by Miss Anne Shaw, M.A., M.I.P.E., at the Mathers Hotel, Whitehall Crescent, Dundee, at 7.45 p.m.
- 16th **BIRMINGHAM SECTION.** A lecture on "The Science of Gear Tooth Production," illustrated by films, will be given by Mr. B. F. Bregi, at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, at 7.0 p.m.
- 16th **EDINBURGH SECTION.** A documentary film on "Mechanical Handling," with a commentary by Mr. Neal Arden, will be shown at the North British Station Hotel, Edinburgh, at 7.0 p.m.
- 16th **HALIFAX SECTION.** The Annual Dinner will take place at the Old Cock Hotel, Halifax, at 7.0 p.m.
- 16th **LIVERPOOL SECTION.** A lecture on "Air Operated Fixtures," will be given by Mr. C. M. P. Willcox at Radiant House, Bold Street, Liverpool, at 7.15 p.m.
- 16th **WESTERN SECTION.** A lecture on "The Shaping of Steel," will be given by Dr. C. J. Dadswell, Ingénieur E.S.F., M.I.Mech.E., at the Grand Hotel, Bristol, at 7.15 p.m.

November—cont.

- 16th MANCHESTER SECTION. A lecture on "Recent Developments in the Glass Industry," will be given by Mr. A. M. Robertson, at the Mechanics Institute, Crewe, at 7.15 p.m.
- 16th. LUTON GRADUATE SECTION. A lecture on "Glass and the Engineer," with a sound film "Looking Through Glass," will be given by Dr. A. J. Holland, M.Sc., A.R.C.S., D.I.C., in the Small Assembly Room, Town Hall, Luton, at 7.30 p.m.
- 17th GLASGOW SECTION. A lecture on "Motion Study," will be given by Miss Anne G. Shaw, M.A., M.I.P.E., at the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, Glasgow, C.2, at 7.30 p.m.
- 17th LONDON SECTION. A lecture on "Modern Methods of Gear Production," will be given by Mr. B. F. Bregi at the Royal Empire Society, Northumberland Avenue, London, W.C.2, at 7.0 p.m.
- 17th CORNWALL SECTION. A lecture on "Tin Metal—Mining and Production," will be given by Col. G. A. Whitworth, O.B.E., A.C.S.M., M.Inst.M.M. and other speakers.
- 18th E. COUNTIES SECTION. A lecture on "Management Through Cost Control" will be given by Mr. T. H. Nicholson, F.C.W.A., M.I.I.A., in the Lecture Hall, Electric House, Ipswich, at 7.30 p.m.
- 18th N. EASTERN GRADUATE SECTION. A documentary film on "Mechanical Handling" will be shown at the Neville Hall, Mining Institution Westgate Road, Newcastle-upon-Tyne, at 6.45 p.m.
- 21st N. EASTERN SECTION. A lecture on "The Human Factor in Productivity" will be given by Dr. E. Jacques in the Neville Hall Mining Institution, Westgate Road, Newcastle-upon-Tyne, at 7.0 p.m.
- 21st DERBY SUB-SECTION. A lecture on "The Mass Production of a British Alarm Clock," illustrated by a film, will be given by Mr. E. Desmond at the School of Art, Green Lane, Derby, at 7.0 p.m.

November—cont.

- 21st MANCHESTER SECTION. A lecture on "The Effective Use of Materials" will be given by Mr. R. F. Archer at the College of Technology, Sackville Street, Manchester, at 7.15 p.m.
- 22nd HALIFAX GRADUATE SECTION. A lecture on "The Production of Steel and Bronze Castings for Engineering Purposes" will be given by Mr. G. L. Hancock at the Huddersfield Technical College, Huddersfield, at 7.0 p.m.
- 23rd BIRMINGHAM GRADUATE SECTION. An afternoon visit to B.S.A. Tools Ltd., Mackadown Lane, Marston Green, Birmingham, has been arranged.
- 24th LEICESTER SECTION. A lecture on "The Jig Boring Machine as a Production Tool" will be given by Mr. V. J. Sayers, M.I.E.D., at the Leicester College of Technology, Room 104, The Newarke, Leicester, at 7.0 p.m.
- 24th LONDON GRADUATE SECTION. A film on "Tools for the Job" will be shown, followed by a discussion on "Cutting Tools" by Messrs. Rose, Hardwick and Faulks, at the Institution of Production Engineers, 36, Portman Square, London, W.1, at 7.15 p.m.
- 24th S. WALES & MON. SECTION. The lecture announced in the October Journal has now been cancelled.
- 26th LONDON GRADUATE SECTION. A visit to Arthur Guinness, Son & Co. Ltd., Park Royal Brewery, London, N.W.10, has been arranged, starting at 10.0 a.m.
- 29th LUTON, BEDFORD & DISTRICT SECTION. A lecture on "Arc Welding as a Production Process" will be given by Mr. K. Doherty in the Small Assembly Room, Town Hall, Luton, at 7.0 p.m.
- 29th WESTERN SECTION. A lecture on "A New Conception of Britain's Energy" will be given by Sir Claude Gibb, C.B.E., M.I.P.E., under the auspices of the Bristol Association of Engineers, at the Physics Lecture Theatre (Royal Fort) at 6.0 p.m.
- 29th LINCOLN SUB-SECTION. A visit has been arranged to the works of Ransome & Marles Bearing Co. Ltd., Newark-on-Trent, starting at 7.0 p.m. This is a joint meeting with the Newark Engineering Society.

November—cont.

- 30th **SHREWSBURY SUB-SECTION.** A lecture on "Corrosion of Metals" will be given by Mr. G. T. Peat at the Technical College, Shrewsbury, at 7.30 p.m.
- 30th **CORNWALL SECTION.** A lecture on "A New Conception of Britain's Energy" will be given by Sir Claude Gibb, C.B.E., M.I.P.E., at Holman's Canteen, Dolcoath Road, Camborne, at 7.15 p.m.
- 30th **S. WALES & MON. SECTION.** A lecture on "Payment by Results Critically Examined" will be given by Mr. E. C. Gordon England, F.R.Ae.S., M.I.P.E., F.I.I.A., at the South Wales Institute of Engineers, Park Place, Cardiff, at 6.45 p.m.

December

- 1st **WESTERN SECTION.** The Annual Dinner and Dance to be held at the Berkeley Cafe, Bristol, at 7.0 p.m. (for 7.30 p.m.) will be attended by the President of the Institution and the Lord Mayor of Bristol.
- 2nd **WEST WALES SUB-SECTION.** A lecture on "Quality Control" will be given by Dr. B. P. Dudding, M.B.E., Ph.D. in the Civic Buildings, Swansea, at 7.30 p.m.
- 5th **HALIFAX SECTION.** A lecture on "The Production of Form Grinding Wheels by Crushing and Diamond Dressing" will be given by Mr. S. J. Harley, B.Sc., M.I.Mech.E., M.I.P.E., at the White Swan Hotel, Halifax, at 7.15 p.m.
- 5th **YORKSHIRE SECTION.** A lecture on "The Latest Development of Grinding Machines" will be given by Mr. G. H. Bottomley, at the Hotel Metropole, King Street, Leeds, 1, at 7.0 p.m. This lecture will be followed by a Works Visit on 7th December, to John Lund Ltd., Cross Hills, Keighley.
- 6th **BIRMINGHAM.** The Senior and Graduate Sections will hold a Christmas Party and a Dance at the Grand Hotel, Birmingham.
- 7th **WOLVERHAMPTON SECTION.** A lecture on "Foundry Technique in Relation to Engineering Production" will be given by Mr. G. R. Shotton, at the Dudley & Staffordshire Technical College, Dudley, at 7.0 p.m.

December—cont.

- 7th **PRESTON SECTION.** A lecture on "Costing as an Aid to Management" will be given by Mr. H. H. Norcross, A.I.P.E., F.C.W.A., F.I.I.A., at Clayton, Goodfellow & Co. Ltd., Atlas Iron Works, Park Road, Blackburn, at 7.15 p.m.
- 7th **WESTERN SECTION.** A lecture on "The Measurement of Productive Efficiency" will be given by Mr. Walter C. Puckey, M.I.P.E., F.I.I.A., at the Grand Hotel, Bristol, at 7.15 p.m.
- 8th **DERBY SUB-SECTION.** A lecture on "Industrial Design" will be given by Mr. W. N. Rodgers, at Becket Street Sales Room at 7.0 p.m. This will be a joint meeting with the Institution of Industrial Administration.
- 8th **LONDON SECTION.** A lecture on "Budgetary Control and Standard Costs from the Production Engineer's Standpoint" will be given by Mr. L. W. Robson, F.C.A., F.C.W.A., at the Royal Empire Society, Northumberland Avenue, London, W.C.2, at 7.0 p.m.
- 9th **COVENTRY SECTION.** A lecture on "Defects and Developments in Deep Drawing and Pressing" will be given by Dr. J. D. Jevons, B.Sc., F.R.I.C., F.I.M., at the Greyfriars Rooms, Geisha Cafe, Hertford Street, Coventry, at 7.0 p.m.
- 9th **LONDON GRADUATE SECTION.** A report on the Swiss Industrial Tour, June 1949, will be given, followed by a discussion on arrangements for future tours, at the Institution of Production Engineers, 36 Portman Square, London, W.1, at 7.15 p.m.
- 10th **YORKSHIRE GRADUATE SECTION.** A lecture on "Design of Gearing" will be given by Dr. W. A. Tuplin, D.Sc., M.I.Mech.E., at the Great Northern Station Hotel, Leeds, 1, at 2.30 p.m.
- 12th **SHEFFIELD SECTION.** A lecture on "Coal Production Methods" will be given by Mr. R. G. Baker, at the Royal Victoria Station Hotel, Sheffield, at 6.30 p.m.
- 13th **WOLVERHAMPTON GRADUATE SECTION.** A lecture on "An Engineer's Survey of the Impact Extrusion Process" will be given by Mr. R. Hanes, M.A., G.I.Mech.E. at the County Technical College, Wednesbury, at 7.15 p.m.

December—cont.

- 13th DUNDEE SECTION. A "Short Papers" evening will be held at Mathers Hotel, Whitehall Crescent, Dundee, at 7.45 p.m.
- 14th LIVERPOOL SECTION. A Discussion on "The Effective Use of Materials" will be held at the Exchange Hotel, Tithebarn Street, Liverpool, at 7.15 p.m.
- 14th LUTON GRADUATE SECTION. A lecture on "Plastics in Engineering" will be given by Mr. Y. W. Rayden, accompanied by a sound colour film on "Fabrication of Perspex" in the Small Assembly Room, Luton Town Hall, Luton, at 7.30 p.m.
- 14th N. EASTERN SECTION. A lecture on "Cast Iron as an Engineering Material" will be given by Mr. H. T. Angus, in the Neville Hall Mining Institution, Westgate Road, Newcastle-upon-Tyne, at 7.0 p.m.
- 15th GLASGOW SECTION. A lecture on "Modern Surface Coatings" will be given by Mr. C. A. J. Taylor, M.Sc., A.R.I.C., at the Institution of Engineers and Shipbuilders, 39 Elmbank Crescent, Glasgow, C.2, at 7.30 p.m.
- 15th LEICESTER SECTION. A lecture on "Applying Air to Work Holding Fixtures," illustrated by lantern slides and equipment under operation, will be given by Mr. Christopher Willcox, in Room 104, Leicester College of Technology, The Newarke, Leicester, at 7.0 p.m.
- 15th MANCHESTER GRADUATE SECTION. A lecture on "Design for Welding" will be given by Mr. F. Koenigsberger, A.M.I.P.E., in the Reynolds Hall, College of Technology, Manchester, at 7.15 p.m.
- 15th LONDON GRADUATE SECTION. A visit to the British Oxygen Co. Ltd., Angel Road, Upper Edmonton, London, N.18, commencing at 2.30 p.m. has been arranged.
- 16th COVENTRY GRADUATE SECTION. A lecture on "Surface Finish and its Measurement" will be given in Room A.5, Coventry Technical College, The Butts, Coventry, at 7.15 p.m.
- 16th E. COUNTIES SECTION. A lecture on "Metallurgy and Its Importance to Production Engineering," will be given by Dr. A. R. E. Singer, at the Britannia Works, Colchester, at 7.30 p.m.

December—cont.

- 16th **N. EASTERN GRADUATE SECTION.** A lecture on "Calculations Involving Tolerances" will be given by Mr. W. York, Grad.I.P.E., in the Neville Hall Mining Institution, Westgate Road, Newcastle-upon-Tyne, 1, at 7.0 p.m.
- 19th **DERBY SUB-SECTION.** A lecture on "Induction Heating" will be given by Mr. W. S. G. Cosgrave, B.Sc., A.I.M., at the School of Art, Green Lane, Derby, at 7.0 p.m.
- 19th **MANCHESTER SECTION.** A lecture on "Control of Overhead Cost" will be given by Mr. T. G. Rose, M.I.Mech.E., M.I.P.E., F.I.I.A., at the College of Technology, Sackville Street, Manchester, at 7.15 p.m.
- 20th **LUTON, BEDFORD & DISTRICT SECTION.** A lecture on "Sheet Metal as a Substitute for Other Material" will be given by Mr. J. A. Grainger, A.M.I.P.E., in the Small Assembly Room, Town Hall, Luton, at 7.0 p.m.
- 21st **EDINBURGH SECTION.** A lecture on "Scotland's New Industries" will be given by Mr. C. A. Oakley, B.Sc., Ed.B., at the North British Station Hotel, Edinburgh, at 7.30 p.m.

SECTION ACTIVITIES

BIRMINGHAM GRADUATE Much of the Section Committee's time during the summer months was spent in organising the very successful Graduates' Convention which was held on September 3rd at Birmingham University. Mr. R. V. Brown, the Section Chairman, and Mr. T. Houghton are to be congratulated on the efficient manner in which the event was conducted. A full report appears elsewhere in this issue.

BOMBAY Since the Inaugural Meeting of the Section on May 30th, 1949, there have been two lecture meetings—in July, Mr. E. H. Y. Burden, A.M.I.P.E., gave a paper on "The Production Engineer, His Problems, His Methods, His Results", and in August, Mr. R. A. P. Misra, A.M.I.P.E., lectured on "Training of Technicians for Industry".

Attendance at meetings has been excellent and the subsequent discussions of a most instructive nature.

It is already felt that the Bombay Section of the Institution is rapidly becoming recognised among engineering interests in this part of India.

CALCUTTA No meetings have been held during the past quarter, but applications for membership are still being received at a steady rate.

COVENTRY GRADUATE Activities during the past quarter have been confined to monthly Committee meetings, which have been very well attended. The Section regrets to report the resignation of the Chairman, Mr. R. L. Crow, Grad.I.P.E., and records appreciation of his past services.

DERBY In addition to the usual lectures, a joint meeting has been arranged with the Institute of Industrial Administration on December 8th, when Mr. W. H. Rodgers will lecture on "Industrial Design".

DUNDEE The Inaugural Meeting of the Section was held on October 4th, when the guests included Mr. J. E. Hill, Chairman of Council, the Lord Provost of Dundee, the Principals of the University College, Technical College, and School of Economics, together with prominent local industrialists.

EASTERN COUNTIES The Session opened on September 16th when the Section President, Mr. H. H. Dawson, spoke on "Impressions of a Tour to Canada and U.S.A." The 1949/50 Programme is now complete and the subjects chosen cover many aspects of production engineering.

GLASGOW During the summer, several well-attended visits to works and other places of interest were made.

During the winter session, an experiment is being made in connection with the Common Subject for 1949/50, "Effective Use of Materials". Three members have been asked to contribute, each dealing with the subject as it affects the organisation with which he is connected. As the speakers belong to widely differing organisations, particularly useful contributions are expected.

HALIFAX A varied programme of lectures has been arranged, including not only Management and Costing, but subjects of particular interest in this district. The Annual Dinner will be held in Halifax on November 16th, 1949.

LONDON The Session opened on October 20th, when Mr. W. Core, Section President, spoke on "Selling to the Production Engineer".

The Section Committee have considered the best method of stimulating the interest of Graduate members, and welcome the

Education Committee's suggestion for a Section President's prize to be awarded annually for the best paper by a Graduate. There was an encouraging increase in the attendance of Graduates and Students during the past lecture season.

**LONDON
GRADUATE**

Eighteen members took part in a fortnight's industrial tour of Switzerland in June last, and visited a large number of leading manufacturers of widely varying products. The tour was highly successful from both a social and educational point of view, and the Section Committee have decided to invite all Graduate Sections to take part in a foreign tour which is to be arranged for next year.

**LUTON, BEDFORD
& DISTRICT**

The first meeting of the new Session was held in September, when a lecture on "Furniture Production" was given. The Committee now contains members from Bedford and district, and it is felt that the Section will benefit from fresh points of view.

**MANCHESTER
GRADUATE**

During the summer quarter, no lectures or works visits took place. However, a full lecture programme for the 1949/50 Session has been arranged and it is hoped that Graduates will attend in greater numbers.

NOTTINGHAM

The Section Summer Outing this year took the form of a visit to the Canley Factory of the Standard Motor Co. Ltd., Coventry, to inspect the production of the "Vanguard". The Nottingham members were pleased to meet Mr. B. C. Harrison, President of the Coventry Section, who joined the party for lunch and took part in the visit. Appreciation is due to the management of the Standard Motor Co. for their hospitality and co-operation.

The first lecture meeting of the Session was held on October 5th, when Mr. T. B. Worth, Education Officer to the Institution, gave a paper on "Education of the Production Engineer".

**SOUTH
AFRICA**

In July, Mr. J. O. Pentz, Chief Inspector of Factories, Johannesburg, gave a most interesting paper on "Fencing and Guarding of Machinery". The Annual General Meeting and Dinner was held in August, and in September, Mr. J. Ettershank, Deputy Director, Witwatersrand Technical College, spoke on "Some Aspects of Apprenticeship Training".

SHEFFIELD

The 1949/50 Session opened on October 10th with a lecture by Mr. M. A. Fiennes, M.I.P.E., Managing Director of Davy and United Engineering Co. Ltd., when considerable interest was created in the steelworks and kindred trades in the district.

A varied programme has been arranged for the remainder of the season, and the Section have been fortunate enough to obtain the services of the President of the Institution, Dr. H. Schofield, C.B.E., for the January Meeting.

SHREWSBURY In June, a well-attended lecture was given by Dr. J. W. Jenkin on "Manufacture of Seamless Steel Tubes". No lectures were held in July or August, as the Section Committee had decided not to arrange meetings during these holiday months.

SYDNEY No meetings were held in July or August owing to lighting restrictions. Activities were resumed on September 6th when Mr. Rowell, of General Motors Holden's Ltd., Victoria, spoke on "Tooling Up for the Australian Car".

The main item of interest in the next two or three months will be a visit to the Small Arms Factory at Lithgow, N.S.W., which has been kindly arranged by Mr. Jack Finlay. This factory was last visited by members in 1938, since when considerable extensions have taken place.

The Annual General Meeting was held in October, when the retiring President, Mr. E. L. Olfen, spoke on the growth of the Sydney Section.

WESTERN There has been no activity in this Section during the summer owing to the holiday season. The first lecture meeting was held on October 11th, and a very interesting winter session is anticipated.

WEST WALES The Section Committee have been working hard to ensure that the 1949/50 Session is even more successful than last year, and three very important lectures have been arranged—"Quality Control", by Dr. B. P. Dudding, M.B.E.; "The Production Engineer—His Education and Training", by Mr. T. B. Worth, Education Officer to the Institution; and "The Common Subject", by Dr. E. G. West, B.Sc.

A Dinner Dance will be held in Swansea on November 25th, when a large attendance is anticipated.

WOLVERHAMPTON Monthly Committee meetings have been well attended, and the session opened on September 7th, when a film dealing with Atomic Physics was shown to over 500 members and visitors.

The Annual Dinner was held on October 28th when the principal guests were the Mayor and Mayoress of Wolverhampton, and Mr. W. F. Higgs, Chairman of Higgs Motors, and Mrs. Higgs.

INSTITUTION NOTES

The Address was given by Mr. Higgs, whose subject was "Is All Well with British Industries?"

The Summer Outing was combined with a Works Visit to Dowty Equipment, Ltd., Cheltenham, and proved most successful.

**WOLVERHAMPTON
GRADUATE**

No lectures were held during July and August, but the Section Committee have held regular meetings.

A works visit to Walter Somers, Ltd., Halesowen, was held during the night shift on August 23rd, when great interest was shown in the special German machinery which has been acquired as reparations.

The first meeting of the present Session was held on September 16th, when Mr. T. B. Worth, Education Officer to the Institution, spoke on "Graduate Status—Its Responsibilities and Implications".

BIRMINGHAM GRADUATE CONVENTION

The Convention on "Training and Leadership in Industry," held by the Birmingham Graduate Section of the Institution at Birmingham University on September 3rd, 1949, proved to be an outstandingly successful and well-organised function, from which much valuable criticism and suggestion arose on this important subject.

The proceedings were opened by Mr. R. V. Brown (Chairman, Birmingham Graduate Section), who introduced the Convention President, Professor T. U. Matthew, M.I.P.E. (Lucas Chair of Production Engineering, Birmingham University).

In his opening address, Professor Matthew said that this assembly of the Graduates was a unique occasion in the annals of the Institution, and he hoped it would be the first of many such conventions.

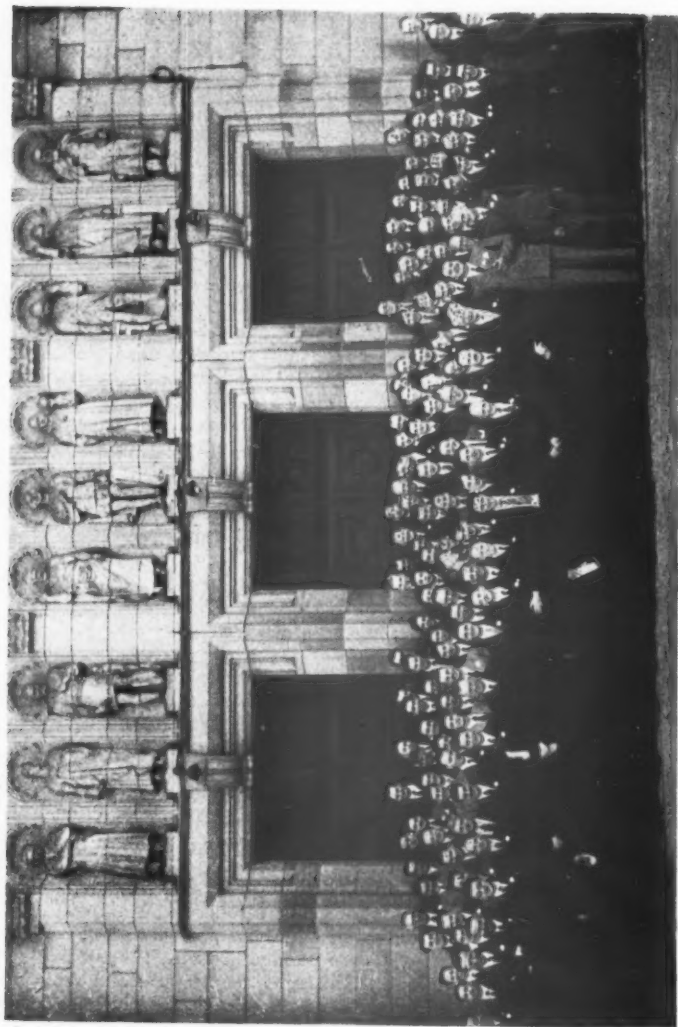
"The Institution," he continued, "has taken many positive and active steps in building up the knowledge and application of production engineering techniques in industry. We know that the Institution has played an important part in building up P.E.R.A., which is a valuable asset in production engineering research. It has played a leading part in the sponsoring and stimulating of interest in Higher National Certificate courses in the technical colleges, and I think that the practical nature of the Institution's outlook has been shown by the appointment of an Education Officer.

THE ONLY SOLUTION

"We are met today at a time when our leading political figures are on the way to the United States to try and solve the background problems which oppress us all. We know, however, that irrespective of any agreement, financial or otherwise, which they may make for us, they are going to return with this same theme which has been so strong since the war—that what we need is an increase in national productivity to put us on our feet, and to regain for this country the leading position in industrial production which it used to enjoy.

"For this task, in my opinion, British industry has many really important resources—human, engineering resources. I think the most important is the resource which we have for increasing and disseminating knowledge in our own particular field, that of production engineering. There are different means of doing this, including research going forward in these great universities; special training courses in all our technical colleges; professional institutions, including our own, which are a means of bringing to

BIRMINGHAM GRADUATE CONVENTION



BIRMINGHAM GRADUATE CONVENTION
September 3rd, 1949.

the public notice the practical and theoretical advances which are being made, and finally we have our technical press, and I am happy this morning to be able to welcome quite a number of representatives to this Convention, because I feel that our great technical press in this country has a most important function to perform in picking up and co-ordinating the activities of all these different layers of interest.

"I look to this Convention as a means not only of bringing together Graduates from all parts of the country, but also, with the support of our senior members from the Midland Sections and other parts of the country, of bringing them into touch with Graduate members. I think it is of the greatest importance that this should happen, so that when we go home this evening we will have made friends, both among Graduates and with some of the senior members of this Institution to whom we can look in the future for guidance and help, and I know that this will be forthcoming. Any Graduate who looks to a senior member for assistance will find it ready and waiting."

AN IMPORTANT STEP

As evidence of the interest which the senior members of the Institution were taking in the development of methods of training and education, Professor Matthew drew attention to the announcement of the establishment of the Schofield Travel Scholarship.

Following on the appointment of an Education Officer, and the developments and discussions held by the Education Committee and elsewhere on further schemes for Graduate study and post-Graduate education and higher studies in the field of production engineering and management, this Schofield Travel Scholarship as applied to production engineering was a very important step.

The selection would not depend entirely on academic distinction. Men were required who would represent the Institution abroad and, in addition would be able to transmit back to the Institution and their own firms something of any knowledge they had gained, or any new angle in human relations in management practice or in the actual production technique which they had acquired.

Before turning to the programme, Professor Matthew said that the presence of Major-General Appleyard, President-Elect of the Institution, Mr. J. E. Hill, Chairman of Council, the President of the Birmingham Section and the President of the Wolverhampton Section augured well for the Convention, and offered Graduates a grand opportunity of meeting their senior members.

Mr. Walter Puckey, Vice-Chairman of Council, was unfortunately unable to be present, but had sent a telegram of good wishes for a most profitable and enjoyable discussion. This, Professor Matthew thought, struck the keynote of the day.

Major C. B. Thorne, M.C., Director and General Secretary of the Institution, then delivered a message from the President, Dr. H. Schofield, C.B.E., who was then in Norway and had sent his sincere regrets at not being present.

Dr. Schofield, said Major Thorne, was a man who had closely identified himself with the future generation, and the establishment of the Schofield Travel Scholarship was a fitting tribute to him.

Major Thorne was sorry to see from the programme that there was no Graduate addressing the Convention. He hoped young members would use the Institution as a platform, to experiment in articulation and the power of expression, lack of which could prove a serious defect to lecturers. Introducing the first speaker, Mr. T. B. Worth, Education Officer to the Institution, Professor Matthew said that Mr. Worth had had wide terms of reference which had taken him very far afield. He knew intimately Universities and Technical Colleges in all parts of the country, and was an excellent person to speak on qualification and further education in this sphere.

Mr. Worth, whose subject was :—

“ QUALIFICATION AND FURTHER EDUCATION ”

said that qualification was so linked with further education that comment upon one must, necessarily, embrace the other to some extent. Both were of considerable importance to Students and Graduates.

Throughout all progress, whether of individuals or material, stages were reached which presented the problem of “ What is the next step ? ”—a fundamental of analytical and scientific approach.

Again, there was the importance of the contributions of Students and Graduates to industrial progress, to production, to the profession of Production Engineering, and to their individual development. It was the next steps on which he wished to comment, by indicating the opportunities in the field of production as he saw it today.

IMPORTANCE OF JUNIOR MEMBERS

The Council of the Institution had always attached the utmost importance to the junior grades of membership—they had their own particular problems and viewpoint, and had a contribution to make of no mean proportion. Since 1929, there had been at least twenty major publications of the Institution having some bearing on the subject, and it was the perennial concern of the Institution, their natural parent body, that there should be available to the whole productive field of industry a flow of young engineers who, by encouragement and guidance, had achieved qualification through education, training and experience so planned as to ensure the maximum contribution to productive efficiency.

Consideration of Qualification thus presented a useful opportunity of commenting upon certain important aspects of the profession, which had been described by an eminent industrialist and educationalist as "a new and important career demanding ability of the highest order and a particular aptitude differing from that required of the engineer who specialises in design or research."

Too frequently, continued Mr. Worth, it was not realised that "attitude of mind" played a big part in the solution of problems of production. This attitude of mind grew from a realisation of the human and material complexity of apparently simple actions, and was best encouraged through formal education and training, linked with individual institutions through the activities of the Institution, of which the present gathering was a typical example.

The comment quoted inferred a degree of specialisation, which was of some importance. Specialisation, so often interpreted as "narrowness," should be defined as the matching of an individual's distinct abilities to a particular function or group of functions, an interpretation which was in the true tradition of the science and practice of production engineering.

The base upon which qualification might be achieved had broadened with experience of the application of the methods of scientific approach to productive technique and production management. It was logical therefore, that the roots of the profession of production engineering should have grown from the fundamental accuracy of the machine-tool—or further—the straight-edge and flat surface.

This aspect was still of great importance, but there was a parallel development resulting from the successful application of production engineering principles to the production of products not in the field of metalworking, but produced through the medium of engineering.

This was particularly true of the principles underlying the successful application of plant layout, material handling and the tools of production management such as Work Study and Planning.

ACHIEVEMENT OF QUALIFICATION

Qualification had a certain distinctive ubiquity, and the avenues by which it might be achieved were today both narrower and more numerous—narrower because the standard now expected was of a high order, more numerous through a multiplication of opportunity.

There was an increasing realisation that the traditional avenues of qualification did not, *per se*, produce the attitude of mind required for economic production, and that specific schemes of technical education and training must be provided and supported. This expression found national outlet through debates such as the Adjournment Debate in the House of Commons on 15th July, 1949,

on the subject of Production Engineering and Management (Training).

The characteristics of Qualification and Further Education for production engineering implied a degree of maturity. It was likely therefore, that in planning technical education and training schemes, all organisations whether large or small, and irrespective of the product, would have to give consideration as to how far they could grant release for selected personnel, beyond the normal apprenticeship period. The dynamic nature of production engineering made it essential to assure rejuvenation and continued alertness concerning materials, processes and engineering management techniques.

On the other hand, it was important that youth should realise that effective educational schemes, both within industry and without, were expensive, and prove by results that such cost was a sound investment.

Mr. Worth took the opportunity of drawing attention to the frequent comment that few principles of production engineering could be applied to other than large scale or continuous production. He was positive that in even the smallest organisation and for the



Included in this photograph taken at the Convention are (*front, right to left*) Mr. Harold Burke, President of Birmingham Section; Major-General K. C. Appleyard, C.B.E., President-Elect; Professor T. U. Matthew; Mr. Percy Edwards, Chairman, Membership Committee; and Mr. R. V. Brown, Chairman, Birmingham Graduate Section. In the second row (*centre*), Mr. F. Bernard White. and Mr. B. G. L. Jackman

most individual of products there should be an engineer who by technical education, training and experience, had the attitude of mind which ensured economy of effort, and the most efficient use of equipment.

Qualification for production engineering was sometimes assumed as divided in some respect from technology and practice, and as embracing only the subjects which were studied under the omnibus title of Administration, or in America, Industrial Engineering.

With this, Mr. Worth disagreed: the correct qualification ensured a fairly intimate knowledge of the mechanics of the work it was decided to measure and control.

CAREER PROSPECTS

With regard to the prospects of a career, assuming qualifications, Mr. Worth said there was no doubt that we were passing through social changes which tended to restore a regard for good and accurate workmanship. Such changes would undoubtedly affect the Production Engineer, who, of all professional engineers, was most closely allied with the actual doing of the job and with the administration of the factory.

Finally, on the subject of qualifications, he would say that one aspect which above all others received the least attention was that of elimination of waste—both of human potentiality and of material. A qualified production engineer must be concerned with the appraisal of effort, and the evaluation of tasks so that men could be matched to their work.

He would leave Qualification on a philosophic note—he felt that by attaining to a good sound qualification as engineer of production, a contribution could be made not only to national well-being through economic production but to the good of all in ensuring security of the material things of life, and in that security we could perhaps develop a philosophy of life and “apply to social problems the realistic, incisive and well ordered thought that characterises good professional thinking.” (Dr. B. E. Doherty.)

DEVELOPMENT OF FURTHER EDUCATION

Turning to Further Education, we must again trace the paths which would allow of the fullest development.

Whereas up to Graduateship or “Initial Qualification,” technical and introductory management studies were characterised as largely formal, as indeed is practical training, post-graduateship studies demanded more individual contribution. There would be some degree of direction but progress would be largely in direct proportion to the contribution of the individual, not made through pressure from without but through enthusiasm. Such studies might or might not result in a paper qualification, but there was no doubt of their value in effecting an extension of preliminary qualification.

Moreover, by their very informality, such activities would contribute very much towards developing individual characteristics and breadth of outlook.

Originating largely from our realisation of neglect in the past, there had accumulated in this country a large potential development in all forms of Further Education—particularly in Technology and Management. It was probable therefore that the younger Graduate would have more opportunities for Further Studies of a formal type than at any time in the history of the Institution. Attention should be drawn also to the problem of the most effective form of relationship between all establishments concerned with education for higher technology and advanced management.

Mr. Worth hoped that any administrative difficulties might be resolved to enable a two-way interchange between Universities and Technical Colleges, and other Higher Education establishments, embracing both formal and non-formal studies.

It was true that Technical Education in the past had been somewhat of a "Cinderella," and they must be prepared for considerably more expenditure in this respect than hitherto. This was particularly true of that section of Technical Education which concerned Production Engineering and Management.

The younger citizens would be both subscribers and beneficiaries, and it would be largely due to their efforts whether or not in the



Another group of delegates with Mr. K. R. Evans, Manager of the Educational Department of Metropolitan Vickers. (*centre front.*)

years to come Technical Education would still be considered "financially hamstrung."

On the other hand, there had been outstanding contributions to the subject—particularly in the Midland area, where tribute should be paid to those authorities which had enabled the Technical Colleges, such as Birmingham, Wolverhampton and Coventry, to lead the way.

The opportunity should also be taken of wishing Professor Matthew happiness and success in the pioneer work he was doing at the University.

PLANS FOR THE FUTURE

In anticipating the general pattern with regard to our particular form of Further Education, there would be Post-Graduateship, an extension of Higher National Certificate Schemes—and some developments towards the provision of production engineering content in Full-Time Diploma Courses.

In the University field, there was room for inclusion of production engineering content in the final year of degree courses, thus providing a balanced course in which the fundamentals of design were related to the problems of production.

Post-Graduateship, the introduction of the courses in Management Studies would provide an extension of the opportunities for study of endorsement subjects. It was unlikely that these courses would, in all cases, satisfy the problem, imposing as they did a considerable period of study after the studies in technology. Some selection was rather indicated including initially the subjects for the final part of the Institution's Associate Membership examination. Mr. Worth mentioned this as it was probable that after Graduateship the desire would be to develop education and training in Production Management, thus effecting the desirable link between Technology and Management.

The pattern now crystallising showed that, Pre-Graduateship, the Senior Technical Colleges would continue to provide the main avenues for Technical Education for Production Engineering.

Post-Graduateship studies, in both Technology and Management should follow parallel channels in which both the Colleges and the Universities would play their part by virtue of their particular contributions. There must be, however, provision for a two-way flow, if the best use was to be made of the facilities.

The Institution would publish shortly an important "Scheme of Further Studies" which anticipated the above development. This scheme was Post-Graduateship and was a logical extension of the forthcoming Associate Membership Examination of the Institution, which could be looked upon as a graduating academic stage.

**VALUE
OF STUDY
GROUPS**

The "Scheme of Further Studies" envisaged studies in scientific and technological subjects and in management, and Mr. Worth hoped it would be implemented in such a way as to result in the formation of study groups in Technical Colleges and in Universities, such groups being formed by Graduates who could study both formally and informally. If such projects were chosen to be of direct relation to the daily work of the Graduates, with the co-operation of industry, they could be investigated individually in the various works—and the results collated by group discussion. This was perhaps a long term project, but the educational value was obvious.

Mr. Worth had in mind a national scheme with the Institution as the co-ordinating body and with the development of Graduates as the prime objective, but with the possibility of by-products of considerable importance.

It should be made clear that all Further Studies entailed sacrifice by all partners—industry, education, and the individual. They added too, to the burden of education which in the technical field was already great, and it was probably desirable that only those whose ability ensured a degree of success should undertake such activities. In that lay a challenge—remembering our function with regard to waste.

Mr. Worth commended, further, that Graduates should consider the avenues of Further Education through part-time teaching. They had something to offer, and in the process of aligning their own training and experience, and by association with professional lecturers, they would experience an educative activity of the first order.

It should be remembered also that engineering had something to offer other industries. By the study of Working Party Reports and similar publications, and by the searching for analogy and application, the young Production Engineer would keep alive the habit of study and the enthusiasm which came of new ideas.

Active participation in the affairs of the Institution resulted in educational benefit and the assurance of a vigorous growth both of the profession and the Institution by the contribution of youth.

Mr. Worth concluded: "I am aware that you have opening before you facilities for Qualification and Further Education which are greater than at any other time.

"By taking every opportunity to contribute to the advancement of your profession, you will follow a long line of eminent production engineers, whose efforts and self-sacrifice have made a major contribution to the well-being of industry, and have laid sure foundations for your professional body, the Institution of Production Engineers, whose corporate energy is devoted to the maintenance of the highest professional standards, towards which Qualification and Further Education ultimately lead."

Professor Matthew then introduced the second speaker, Mr. Kenneth Evans, M.A., Manager of the Education Department of Metropolitan-Vickers, Ltd.

Mr. Evans had been for many years keenly interested in the development of education and training within industry, and schemes associated with industry. The Metropolitan-Vickers Education Department, under Mr. Evans' direction, had sponsored a number of very profitable courses which were taken by advanced research workers and University Professors, and there the knowledge that had been gained, not only in production but in design problems, was subjected to critical review and analysis. This was, Professor Matthew thought, a most effective way of co-ordination.

Mr. Evans was a member of the British Association for Commercial and Industrial Education, and was one of the outstanding authorities in educational development within industry, particularly for the younger worker.

Mr. Evans who spoke on :

" INDUSTRY'S PART IN A BALANCED TRAINING "

said that the question of balance was most important. There were three legs to a tripod, which he believed was the most stable form of seat obtainable : one was contained in formal education in colleges and schools; another part, that of industry, was to give practical workshop experience, and the third leg was formed by the general experience of young people like themselves.

They must not let their Institution do all their thinking for them. Mr. Worth had given a gentle hint that they might employ their time in the evening otherwise than in a lecture theatre ; that was part of their education, as were all the other enjoyable, recreative and social activities all of which were available to the community, in works clubs and so on, which had an important part to play in their training.

The only real claim he could have to talk to those present, said Mr. Evans, was that he had had the privilege of being responsible for the training of nearly 3,000 University graduates, in addition to those of other grades, during his time at Metropolitan-Vickers. About 750 had come from Universities and Technical Colleges in the Dominions, Colonies and foreign countries throughout the world. Those people coming in, either as craft apprentices, or as graduates after a University course, in the age-range of 14-23, formed a university in themselves, because of their origin from all parts of the world and all grades of society. He wanted to emphasise that whether the University student was the son of some fortunately-remunerated man, or whether he was the son of an artisan who got a scholarship, they had the same opportunities at the University to gain scientific and technical degrees. They rubbed shoulders

with other graduates from all over the world, and that, in his opinion, was one of the most valuable parts of their training.

The procedure in the past had been first school, second college, third works training, and therefore there was, in Mr. Evans' early days in his Company, a tendency for young people to enter industry for the first time after they had received a degree. There was very little graduate apprentice training, and there was very little pre-University training, and therefore young men grew up to the age of twenty-one or twenty-two before they appreciated industrial conditions, and it took them a considerable time to settle down. Fortunately that had now been greatly altered.

THE IDEAL TRAINING SCHEME

He thought a "near-ideal" scheme was one introduced by his Company more than twenty years ago. A young man was taken from school, with a good record both in work and play, who showed signs of responsibility and of having taken an active part in a "managerial" way in school functions; he was brought into the works for a year (an academic year, from September to August), released for a day a week for further studies, and then went up to his University. In the vacations, he went into other works, went abroad, learned a language abroad, sailed as a supernumary engineer in a cargo ship, or did *something* to broaden his point of view. After graduation he returned to complete a two-year practical training, of which some ten months had already been done. Up to this point all was preparation; then, what was loosely termed 'specialisation' commenced.

EDUCATION IN THE WORKSHOP

Mr. Evans continued: "As you know, under all apprenticeship courses you go into the workshops. I wonder how many of you younger people have yet appreciated that it is one of the most valuable parts of your education?"

"In those contacts in the shop you will meet the silent few—the good, solid workers who take a pride in their work and do not talk too much. You will meet the other few who are vociferous in putting forward a half-educated point of view and airing their opinions because they like to hear their own voices, and like to feel they are impinging their will on others, but who are not either experienced enough or educated enough to do so with real authority. Beware of them! They are not well-informed in most cases, but they may do an enormous amount of mischief.

"I would interrupt here to say we had a man (well-known to Major-General Appleyard), Sam Radcliffe, who was made Chairman of the Works Committee, and he remained so for 25 years until he retired at the age of about seventy a few years ago.

"He was one of six men sent by the "Daily Mail" to study production methods in the U.S.A. in 1922. That shows you that

there was an appreciation that we could learn from abroad in engineering fields in those days. It has been our Company's custom for 31 years to send at least one man every year to the U.S.A. (to Westinghouse or G.E.C.) so I suggest that our industry is not so behind in taking a broad view of the need for wider training.

"Industry's part is to give you fellows help in widening your outlook, give you experience in many fields, and to remind you always that the initiative encouraged by industry must come from you.

"You should have no spare time to enjoy yourselves before you are thirty! I think most of you appreciate my point; I would not wish to be misunderstood. I mean that you get your practical training first as "production" engineers between certain hours, and you have got certain studies of a broadening nature; you may take part-time day or evening classes; you must sleep and you must eat, and you must give some attention to the opposite sex because that is a good thing, and besides, they expect it! Then there are debating societies, dramatic societies, perhaps a chess club, rugger and soccer, cricket, or hockey on Saturday afternoons to keep you fit.

"If you take an active part in all these things, and serve on Committees, you will be doing a great service to other people as well as yourselves.

"If you do these things because it is a good thing to do, and 'the best way to become the managing director,' you won't! It must be sincere—you must take these jobs up because you want to do them and like doing them, or because you want to help the other fellow (you who think modestly!) who is not quite so capable of running it as you are yourself.

"A serious point—when you are electing officers for these voluntary societies and clubs, do not elect necessarily your best friend, but elect the man who, after cool thought and analysis, is the best man for the job."

In the discussion following these two addresses, the question of a broader education was debated at some length. The educationalists, including Principal Garratt, of Chance Technical College, Smethwick, and Principal Field, of Coventry Technical College, thought that there should be more release from industry for the purpose of formal education.

Mr. Evans was of the opinion that the swing of the pendulum was tending to emphasise too much the idea of advanced technical studies for everybody, and agreed with Mr. M. W. Bentley (Graduate, Birmingham) that a wider and more general education was needed by everyone if they were to succeed.

Mr. Oppenheimer (Graduate, London), suggested that graduates could do something definite in training and interesting them-

selves to such an extent in these problems that sooner or later every Graduate Section in the country would have a Joint Committee to give them a chance of airing their views.

Mr. Worth warmly supported this suggestion, and agreed that Graduates should make a concrete suggestion as to what they felt should be done to ensure an element and basis of broadening upon which courses could be built. It would perform a very valuable service.

Professor Matthew suggested to the members of the London Graduate Section who had spoken that they might formulate a definite proposal which might be placed before the Education Committee, and this was agreed.

THE LUNCHEON

The toast of "The King" proposed by Professor T. U. Matthew, having been honoured, Mr. Harold Burke, President of the Birmingham Section, rose to propose a toast to "The Institution Graduates" with which he coupled the name of Mr. R. V. Brown.

Mr. Burke said that it was a very proud moment for him, as newly-installed President of the Birmingham Section, to see the manner in which the programme of activities had opened, and to know that this first post-war Convention organised by the Graduates had attracted so many entries from all parts of the country.

They had heard, during the morning, many points of view in regard to education. That wonderful word "production" had been much used, and they had also heard the word "co-operation," a word they used a great deal in speech but not so much in practice, though this Convention would, he hoped, point the way in that direction.

At the risk of being tiresome, he would like to leave with them two other words which were often used but not so often practised: the first was leadership—a word used by our national figures quite frequently, and one to which they all aspired.

The second word he wanted to leave with them was enthusiasm, which was also a word very much used but little understood. One of our national characteristics was a tendency to counter-balance that word "enthusiasm." The man who was enthusiastic about his job with a limited amount of knowledge could always acquire more knowledge, but the man who was not enthusiastic would never acquire that knowledge, that experience, that leadership. In the present state of our national economics we required enthusiasm to cope with our problems and to find the solution with which to overcome them. He suggested that leadership and enthusiasm had been displayed in no uncertain manner on this occasion. He was proud to say that almost the whole of the organisation of the Convention had been carried out by the Graduates themselves, and

this was a tribute to their powers of organisation. All the arrangements had gone smoothly, and they had attracted speakers of an international character. He believed the Graduates to be very serious in their determination to come to grips with the problems with which we were faced.

Older members could assist to a tremendous degree, and it was not part of their policy to say to the Graduates "It's up to you!" They would encourage, advise and help to the best of their ability.

Mr. Burke hoped that the confidence which they had gained as a result of their experience would make them broader in their outlook and more experienced in their future activities. It might lead them, at some future date, to have another Convention on broader lines, perhaps for a longer period and of more national characteristics, so that they could together get down to these problems associated with productivity, with co-operation, enthusiasm and leadership.

Mr. R. V. Brown (Chairman, Birmingham Graduate Section) responding to the toast, thanked Mr. Burke and said that while listening to him many of his own thoughts had centred round ideas and views that had been based on a very strong personal confidence—confidence in progress, confidence to achieve the ultimate goal. Such confidence was characteristic of all organised groups and all individuals who had reached a level which was recognised by others as a mark of progress.

When youth in its turn reached that status where it had the responsibility to lead, they also would inspire in others that confidence which was so vital to their own progress. In this way, and in this way only, would progress be maintained. To all Graduates he would say "Continue with the vigour and confidence already shown," and to those of senior years he would say "continue to inspire us with that confidence as you have done in the past, and I know that you will have no cause to question your faith in the future."

In conclusion, Mr. Brown extended a special welcome to Mr. John Hill (Chairman of Council), Mr. Aiers (President, Wolverhampton Section), Professor Tustin (Professor of Electrical Engineering, Birmingham University), Mr. Frank Pennel (Chief Education Officer, Joseph Lucas Ltd.), Principal Garratt (Smethwick) and Principal Field (Coventry).

The Conference then split up into parties for the purpose of touring some departments of the University, following which, members reassembled in the Physics Theatre to hear the Address of the President-Elect, Major-General K. C. Appleyard, C.B.E.

Before reading his Address, General Appleyard expressed his pleasure at being present. He was a new member of the Institution and this was really his first public appearance. He had been

deeply impressed with the large attendance and the calibre of the morning's speeches.

He was delighted to become President-Elect of the Institution, and could think of no other representative body of men with whom he would prefer to be associated.

Introducing his subject,

"YOUTH AND LEADERSHIP IN INDUSTRY"

General Appleyard said that the conclusion to be drawn from his talk could not be other than that which had been come to by so many people in so many lands before—that the spark of the true leader is indescribable in written words.

"There are many types and levels of leadership," General Appleyard continued, "and the gift has been used for both good and evil purposes. Types of leadership differ at different levels where organisations are concerned, and in general the man who attains the highest forms has passed through the lower ones and built up his quality by exercising it in various stages of his progress.

FUNDAMENTALS "In spite of the impossibility of putting one's finger on the inner quality which makes a leader, it may be of interest to consider in the first place some of the fundamentals. We adventure therefore into the realms of psychology by asking, what is leadership?"

"My own answer would be that it is a human relationship between one man and one or many others; that it is essentially spiritual, sometimes emotional, often intelligent as well, and that it results in the impression of the one personality so that there is inspired in the others a reaction in the form of trust, affection, obedience and sometimes hero-worship—the latter often without regard to any kind of cool judgement.

"Leaders are said to be born and not made, and I believe that to be true, although I also believe that many men born with the true capacity go through life without ever realising it or having the opportunity to exercise it. My definition of leadership is, of course, an over-simplification of the matter and discards the problem of what is personality, and how it impresses itself. Some of the difficulties of studying these problems show at once when one tries to get some common denominator between, for example, the impact of the great religious teachers (who led only a few devoted men in the first place, but whose personalities have impressed themselves on the hearts and minds of men over untold generations) with, let us say, great military and political leaders of their own or later ages.

"We may next consider what inherent personal qualities, other than that unknown inner one, go to make up a leader. This involves a study of the human being and I begin by dividing human

beings into classes based on their make-up or temperament. First I record the concise summary of a past Commander-in-Chief of the German Reichswehr which he applied to officers :

‘ I divide my officers into four classes :

The Clever
The Industrious
The Lazy
The Stupid

‘ Each officer always possesses two of these qualities or temperaments.

- (a) Those who are clever and industrious I appoint to the General Staff.
- (b) Use can be made, in certain circumstances, of those who are stupid and lazy.
- (c) The man who is clever and lazy qualifies for the highest posts of leadership. He has the requisite nerves and mental clarity for difficult decisions.
- (d) But whomsoever is stupid and industrious must be got rid of, for he is too dangerous.’

Personally I divide men into four categories of my own :

The Server
The Doer
The Director
The Leader

“ The Server is content to do what he is told and, if possible, to live a modest and secure existence without any other responsibility than that of obeying instructions.

“ The Doer is the man who likes the responsibility for the active work, including the detail, of the enterprise in which he is engaged. He is the true executive, usually energetic in temperament, and if he is a good one, keen and up-to-date in his technical and human knowledge.

“ So far as quality and rank go, I make no difference between the Doer and the Director. The Director is the man of policy and thought, the administrator, with the lazy temperament and a different kind of mentality, one who is more interested in thinking out what ought to be done than actually doing it, who likes the study of business, national and world movements and the planning of policy to ensure that his enterprise develops, or is not caught napping. He is often the highest class of salesman if his judgement of men and opportunity is good.

“ The true Leader is much more rare because he combines many of the mental qualities of the other two and adds those other intangible gifts which are so difficult to put on paper.

"Now, what must a leader at high level have within himself to spur and support him in his task? I would divide my short list into two. Firstly the things that furnish the driving power: I suggest that he must certainly have an objective; enthusiasm and real belief in his cause; imagination and courage; confidence in himself; the power and habit of decision, and a natural acceptance of responsibility. These appear to me to be essential.

"Secondly, he must have the personal equipment with which to deal with all kinds and conditions of people. Here again I pick out a few qualities which I believe to be absolutely necessary. Understanding I place first; knowledge, and perhaps wisdom, which is a different thing; patience; a sense of justice, and the lovely gift of a sense of humour. We add to these the ability to speak or write, which can of course be learned, but some people have no gift for either. Finally, if the habit of success is added to his gifts a man multiplies his own force enormously; lacking it he must ultimately fail as many leaders have done.

"Next, what are the things that most appeal to those who follow or serve a man who is a good leader? I would say first, a feeling that they are understood, then that they are informed and trusted; after that the knowledge that their man has the habit of success and that he is friendly, impartial, just, truthful and determined. Curiously enough, a certain aloofness or reserve, a sense that although friendly he is somewhat apart, is acceptable and apparently attractive.

"Finally, what do those who serve him give to a successful leader? I think I can say very priceless rewards. Confidence, trust, willing obedience, certainly admiration and respect, and occasionally affection and hero-worship but above all, that intangible spiritual support which comes to him continually and refreshes him always with the knowledge that his team believe in him and will never let him down if human endeavour can avoid it.

"I expect that by now you are wondering if this is a bit of lay preaching on philosophy or psychology, and when I am coming to the point. I must remind you, however, that you cannot ignore fundamentals and I believe that it is wise to study them on this subject; even if some of the gifts of leadership are lacking in yourself, it is interesting to analyse others who have them and so increase your own understanding.

INDUSTRIAL LEADERSHIP

"People often say with truth that our industrial enterprises need leadership. Of what kind? I have read that in any small crowd there is always a man who is prepared to stamp his foot and see the others draw theirs back and do what they are told; that is the leadership of power or force. In this country that type has been on the way out for many years.

Today we have to deal with more intelligent and somewhat better educated people. Today's kind of leaders build round themselves a team, and that is the kind of men that industry needs, the leaders of the teams.

"There are of course teams within teams, and in any industry they can be recognised right down to the small group for whom a chageman is responsible. The Foreman heads a larger group and is one of the main parts of the structure in any industrial organisation; at his best he is a real leader, at his worst a real danger. Every department in any works which is well organised has a head who should have some of the qualities of leadership; a sizeable organisation pyramids up until you get to the man at the top, upon whom the ultimate responsibility rests and from whom the driving power and inspiration should flow.

"The young man of ambition may start anywhere in the works and if he has the spark and the gifts there is usually no reason why he should not be able to demonstrate what he is, within the group in which he works. Its activities are usually limited, and here he may come up against his first problem, leading himself. So many men spoil their personalities and their opportunities by revealing their self-confidence as self-importance—the high sign of the little man. Importance must come from the opinion of others. So, to this young man, up against the problem of himself, certain of his ability and filled with legitimate ambition, the necessity of learning and doing his job, accepting discipline, being friendly with and trying to understand his fellows and maintaining a modest outlook is paramount.

"A long way lies ahead before the upper levels of leadership are reached and I believe that the more a man can enjoy interests of varied kinds which bring him human contacts, the more he will fit himself for what is to come. I do not propose to study every step of the way up to the higher levels, but there are a few general points which I feel may be of interest.

"One is that enterprising men seldom seek absolute security. They are always willing to seize an opportunity which offers them scope to do what is in them, even though the immediate effect appears to be disadvantageous. Another is that good men never run down their country or their rivals, and a third is that a leader who is a big man will never take success entirely to himself, but will always ensure that those to whom he is responsible are aware of where credit should lie amongst those who are members of his team.

"It has often struck me that as people rise in the hierarchy of the responsible posts in industry, the specific types of their activities change. For example, in the lower levels of responsibility men have to immerse themselves in detail, but as they rise in the position of

responsible authority they withdraw more and more from detail until they are able to devote themselves wholly to the higher problems. It is necessary to realise and accept this, because men who are promoted to the highest posts and yet retain the desire to interfere in detail are apt to be a nuisance and a handicap to their successors.

"Again, but on the human side, having started as an individual you find yourself presently in charge of a few people whom you have not had anything to do with choosing, and you have to make the best of it, which is excellent experience and discipline. Finally, at the top levels, it is frequently possible to be the absolute chooser of your team, and this is one of the most responsible parts of your job. Judgment of men and the ability to pick them is therefore an invaluable attribute, and an essential one for a great leader. It is also a great responsibility, because the responsibility for the livelihood of men is one of the greatest burdens a conscientious man has to carry.

"One more matter which I feel is of importance is the necessity, when you occupy a responsible post, of providing a competent successor to yourself. The little men fear to do this lest they be displaced, but the larger loyalty to your business, your industry, or your service should bring the desire that under any circumstances which might remove you permanently or temporarily, the show should go on without a check.

"A good leader chooses his team, gives clearly to each member the scope of the job he is to do, the full authority to do it, leaves him alone to do it without interference as long as things go well, trusts him to come for advice and help if things go astray; and gives him the full credit and reward for success.

CONCLUSIONS "In industry the man who really matters finally is the man at the bench or the machine; all of us in superior positions occupy them in order to see that he has work to do, and the ability and facilities with which to do it efficiently and economically. The decline and fall of many concerns has proved this to be true and will do so again. The inspiration of all these people should come from the man at the top, but among those who sustain him in this ultimate task of enabling the man at the bench to work efficiently and economically, there can be few who can do more than the Production Engineer, the very essence of whose work is efficiency, economy and the avoidance of waste whether of human or other material, time, or any other of his company's or nation's resources.

"Governments can disguise the operation of economic laws for a long time, but inevitably the economic law operates in the end, and that is what we face now. To save the situation we are urged

by all parties to produce more, and more cheaply. This is where the competent Production Engineer comes into his own, and this is where the Institution should come into its own and lead. You, the Institution members here, should lead in this sphere of Production Engineering; from you, the Graduates, must come the leaders-to-be of your profession. This developing science must reach into all manufacturing industries. There is much to be learned from them, and much more to give them. Give them—that is the important thing.

“Every man of ability whose task is the technical planning of production should be with us in the Institution, not for what he can get, but for what he can give to enlarge the knowledge and experience of his fellows in so many fields, and because the Institution provides him with fine scope to make a wider contribution to the country’s welfare than he can make alone. We want to see the most generous sharing of knowledge, of methods, and schemes which have proved successful in one industry so that we may apply some of the lessons to others. We want to be stimulated and challenged by the stories of technical and human success.

“If the tempo of all this is speeded up in our present need, if men are filled with keenness to contribute as well as to learn, and if they take their full part in our affairs, then we shall soon see which amongst them are leaders. Here, right in this Institution, is a place of demonstration of some, at least, of those gifts and qualities I have discussed today. Each generation must produce its own leaders from amongst our people, and the turn of the younger ones is always here. If any of you have the spark and can nourish it to flame, you can not only enjoy the inner rewards of the leader but also rejoice in your own particular diminutive form of that lovely bit from Ecclesiastes: “I made me great works, I builded me houses, I planted me vineyards, I made me gardens and orchards and I planted me trees in them of all kinds of fruit.”

General Appleyard’s address was received with prolonged and enthusiastic applause, and Mr. J. E. Hill, Chairman of Council, said they had been extremely fortunate in having such a thoughtful address, so brilliantly delivered.

Mr. Hill said he would like to leave with the Graduates one or two thoughts. One was that it was their ability plus experience which would provide for them a really worth-while place in industry. Another was that if they were never in a position to take orders, they would never be in a position to give them.

After tea in the University Refectory, a discussion took place on the Address by the President-Elect, followed by a summing-up of the proceedings by Professor Matthew. Mr. R. V. Brown, Chairman of the Birmingham Graduate Section, was then called upon

BIRMINGHAM GRADUATE CONVENTION

to put forward the Proposal suggested earlier in the proceedings by the Convention President. This took the following form :

“ That Graduates of the Institution through their Sections should play a more active part in the planning of technical education to ensure that it meets the changing needs of industry.

“ That study groups be formed in all Graduate Sections in the coming session to discuss means of achieving this participation.”

The Convention unanimously agreed that this Proposal should go forward, and the proceedings terminated with a vote of thanks to the speakers and visitors, and to all those whose efforts had made the occasion so successful.

(The Institution tenders special thanks to Mr. T. F. Houghton, A.M.I.P.E., Social Secretary of the Birmingham Section, for permission to reproduce the Convention photographs shown here.)

SOME ASPECTS OF THE INDUSTRIAL EMPLOYMENT OF THE BLIND

by Dr. L. G. FUCHS, A.I.P.E.

Presented to the London Section of the Institution, December 9th, 1948.

I wish to express my appreciation that your Institution should have invited me, a blind psychologist, to talk on a subject which relates to two factors—engineering production methods, and the human factor—and the manner in which these factors are handled to determine success or failure in such employment.

I shall discuss this matter here as part of the major problem of employing all disabled people, of whom there are at present 908,000 on the Disablement Register of the Ministry of Labour. What can be said about the blind applies equally to other categories of disablement. It has a bearing on industrial productivity. I shall also touch on the social and economic background, but I shall confine myself, in the main, to the human and technical side.

DEFINITION OF BLINDNESS

As an introduction I shall first give a definition of blindness, then some of the limitations within which I have to keep this paper and also indicate the historical background to enable you to focus the problem in its right perspective.

The legal definition of blindness is "a person who is so blind as to be unable to perform work for which sight is essential". This is a very wide definition and comprises the blind as well as the partially sighted. The partially sighted are those persons whose sight is sufficient to enable them to rely partly, at least, on their eyesight. Thanks to progress in preventive medicine and ophthalmic surgery, the number of partially sighted within the total number of persons registered blind is increasing, whilst the number of those who are completely blind is falling. As no statistics are available on this subject, I can only estimate that at present more than half of the persons registered as blind are not really blind, but partially sighted. Whilst we hold that the blind and the partially sighted represent two different categories of disablement and should be registered as such, and require differential treatment, for the purpose of this paper I shall not be able to differentiate between them. I can also not distinguish between those blind from birth and those who have become blind later, although such differentiation should be useful, as the latter can still visualise their movements, which would be of great assistance in their industrial work. I am giving you not my personal opinion on the whole employment problem,

but a report on investigations which I have carried out over the last five-and-a-half years.

There are at the present time in the United Kingdom about 2,000 blind persons employed in industry. This is a figure at which I have arrived by computation, as the Ministry of Labour did not release the actual figure for the purpose of this paper. All the other figures I shall mention in this paper have been supplied by the Ministry. The majority of the blind who are working—about 7,000—are still holding out as a “lost brigade” against steel, power and modern production methods in the so-called traditional trades of the blind. For the last thirty years, far-sighted men have known that these trades cannot any longer provide an economic basis. Socially and psychologically such employment—usually carried out in homes or institutions for the blind—leads to segregation from their seeing fellow-men, makes no use of their mental and physical abilities, and does not promote occupational efficiency.

One thing these experiments have brought out very clearly is, that occupational efficiency is one of the important factors towards personality adjustment.

Industrial employment for the blind started in Germany during the First World War under the guidance of Director Perls. Siemens and Schuckert, in one of their Berlin works, were so satisfied with their work on short cycle repetitive jobs that this employment was carried over from war to peace production. In the United Kingdom blind employment started during the last war, and it is interesting to note that it started in 1942, when the labour situation became somewhat more difficult, not by the agencies for the blind, but through the blind people themselves, with the assistance of the Ministry of Labour. Not until about three hundred of them were already working and had proved that they could give satisfaction, did the agencies for the blind take this matter up as a movement.

From my own experience I know that in Central Europe, between the wars, blind employment on the basis of legislation for disabled ex-servicemen, without careful introduction and investigation into its possibilities, proved a failure. On the basis of the Disabled Persons Employment Act, three per cent of all employees should be disabled, but nowhere does the law state how many out of this number should be severely disabled, such as the blind. To make the employment of the blind a permanent institution in British industry, on a scale to absorb all those who are blind but have no other mental or physical disablement and are therefore suitable for employment in industry, such employment must be useful and if possible a paying proposition. The rest of the blind—those who have complementary disabilities—will always be only suitable for sheltered employment and must remain in the care of the agencies for the blind.

A further reason why the majority should be allowed to work with their fellow-men in open industry is that the blind form a cross-section of the population, and the majority come from working-class homes. It was in response to the paramount demand to find future employment that could offer an economic basis under sound social and psychological conditions, that I started my investigations. I have always been convinced that the best education for the blind was of very little use unless you could hold out a good prospect to them of using what they had learned. We have been told many times that the output of the blind in industry is equal to that of the seeing and the output of the partially sighted is slightly lower. Such statements do not tell us a great deal as we are aware how very much output varies from firm to firm. Only if it could be proved that the blind could compete under the fast-changing conditions of production and on a higher production level, always with an eye on likely changes to come, could blind employment become a permanent institution.

In my first year of investigation in a firm of low efficiency and output, my results proved rather what one should not do than than what one should do. The blind were trained there in the orthodox methods of the sighted. They were excluded from machine work, and the blind individuals, whose self-regard knew no bounds when, for the first time in their lives they could do what they had been shown, were left to their own devices. Their output in these circumstances was about 50% of that of the seeing. I did, however, prove to myself that the blind could achieve the same output as the seeing under the following conditions :

- (1) Method to determine suitable work. (The lack of sight necessitates a "blind method" of handling, of which the blind are not aware.)
- (2) This method had to be studied.
- (3) The blind should be trained.

Over the last four-and-a-half years these investigations have been carried out in two radio engineering firms in the Mitcham area.

COMPETITIVE WORK

I shall now discuss those factors which have a bearing on the competitive work of the blind in mass production. Our aim has not been to prove that—and how—the blind could perform industrial work. This has been proved long ago, and success right from the beginning has been greater than in the so-called traditional trades of the blind. There are many instances of blind men who have performed very remarkable feats in a craft, such as electricians or mechanics, but their trouble has always been that they could not make a living out of it, because they were too slow. We are concerned in investigating



FIG. 1. Pin annealing—the operator locates pin with right hand in the permanently moving locating wheel, whilst left hand picks up another pin.

conditions where such slowness could be overcome and what factors determine the efficiency and speed of the blind. It has always been only a matter of opinion to attribute the good achievements of the blind on repetitive work, or the low achievement of the partially sighted, to the presence or absence respectively of those sensorial abilities or character traits with which the blind have wrongly been credited.

SENSITIVITY Let us first discuss sensitivity. A comparison of observations in connection with our twelve partially sighted and our nine blind persons did not suggest a difference in the sensitivity of their tactile kinaesthetic* senses, nor a difference in their power of sustained attention, nor did the blind show a higher sensitivity than the seeing. This latter finding only confirmed what other investigators have found before. In their practical applications in industry, these results meant that you cannot expect the blind to discern by touch what you cannot discern by touch yourself. The blind acquire a high ability, through a life-training of interpreting their sense impressions, but the seeing have

* Kinaesthetic—sensations attending movements of any members of the body arising from special sense organs situated in the muscles, joints and tendons.



FIG. 2. Drilling three holes in bushes, with drill pre-centralised in fixture.

acquired the same high ability of interpretation in their own skills. Coming from the radio industry, I think the best instance I can give is from a valve grid department. It is well known that seeing operators are able to determine or distinguish by touch the very fine wires which are used on radio grids. The differences between these wires are only five or ten microns. If one of the operators informs the supervisor that she is working with the wrong wire, one can be almost sure that she is right. If you ask blind people to distinguish the thickness of these wires they will find it quite impossible. Not unless they are trained and have the opportunity to practise can they make such distinctions. It is often stated that the merit of the blind and their supposed superiority over the seeing in industry lie in their high acuity of touch. It has been possible to dispose of this myth, and one line of investigation in this connection deserves brief mention here. For operational reasons we covered the hands of the blind with two pairs of gloves, thus eliminating to a great extent their tactile impressions, on operations requiring very exact and fast locations. The left hand location in this particular case is the locating of glass stems with a diameter of 3.4 to 3.7 mm. in a location with only .2 mm. tolerance. The location points on automatic glass welding tubes were quite warm and did not allow the hands to linger, otherwise the heat would have penetrated the

gloves—speed being the only real protection against very slight burns. In this way we could observe the exactness of blind location movements. We do suggest that it is not so much touch, but the impressions from the moving parts of the body called kinaesthetic sensations that assist the blind chiefly in their handling. This acquired ability, together with the kinaesthetic memory that develops in persons on continuous manual work and machine operations, we call "motion-mindedness". We suggest this constitutes the main asset of "good" blind and seeing operators alike.

Turning for a moment to the substitution of sight by the remaining senses of the blind, there is an important time factor in minute tactile discrimination which should be taken into account. Trying to discriminate by touch what the seeing discern by sight is too slow a process to be of any use in industry, useful as it certainly is for the blind in their daily lives. With regard to speed, only hearing can compete with vision. This finding throws interesting light on the design of the precision instruments for the blind which are on the market and which are based on tactile discrimination. These instruments—surely designed without consultation with the psychologists—would have had a much greater application and usefulness for blind people if they had been designed on an auditory basis.

Since we have been working with comparatively small groups of blind people, our results can only suggest but do not prove anything conclusive. My whole experience is connected with work in the light electric and radio engineering, and only with regard to short cycle repetitive work. Finally, I would like to state here that I am aware that very useful work has been done in many other industrial firms.

USE OF MOTION STUDY

Motion study has been used in a number of sometimes rather unorthodox ways to investigate the suitability of work by first establishing a purely tactile kinaesthetic handling method, then comparing it with the method of the seeing, and thus determining whether the blind could possibly do the job in the same time as the seeing worker. Motion study usually analyses the physical elements in the operator-job relationship. We have gone back to the mental abilities and attitudes that govern the physical abilities. In so doing, we have found the importance of space perception in operation, and the very important difference between the space perception of the blind on a job and the space perception of the sighted.

Space perception of the blind on the job is based on tactile kinaesthetic impressions, and requires continuous contact with the object to be perceived and analytical successive progress from relevant element to element, and this means more motions on the part of the blind. This higher muscular effort and consequent



FIG. 3. Drilling one hole in 6 mm. spindle showing the spindle location. .

greater fatigue are the reasons why machine work is more suitable for the blind than manual labour, including inspection.

In determining suitability, we cannot simply say the job is more suitable for the blind because the machine time is longer in a whole

cycle and the handling time is higher. It is quite true that blind men consider such jobs "money for jam". These jobs are only useful on short runs, because we have also to consider the interest which blind people can find in their job, especially in the handling time, and whether interest can be put in during the course of training. Therefore one has to strike a happy medium. The blind must work more quickly than the seeing to get the same output. It is a very poor compliment if a firm can state that the output of its blind workers is higher than the output of its seeing employees.

We have used motion study as a basis for an efficient training method and in quite a number of cases have enabled blind people to do jobs which are, mainly, visual. Motion sequences may be arranged and built into a simple rhythm. Our efforts have not been based on micro-motionism—meaning minimum motions—as we are not convinced that these are really quicker. They are based on operational ease and the reduction of effort, taking into account the mental and physical makeup of the individual and making use of the satisfaction that can be derived from efficient operation.

We used motion study as a mental discipline on the sensorial level of the blind. The blind, usually taught and trained by the seeing into a world where much which they learn remains purely verbal knowledge and is not connected with any kind of imagery, often show loose thinking. This has a retarding effect on operational efficiency. Localisation of the blind can become very precise through training and practice, precise within millimetres.

DEVELOPMENT OF SAFETY METHODS

With this finding and the use of motion study, safety methods have been developed as an additional safeguard, quite independent of mechanical guarding; until such time as all machine operations are efficiently guarded, internal guarding should prove useful.

Recognising that the blind man's fingers are his eyes, these motions have been developed in response to the attitude of the working group, the supervision and the management. Persons who see can only visualise how helpless they themselves would be if they were to become blind, and they judge what the blind do, not by their trained actions but by their own fear of blindness. A long process of educating the seeing factory community lies ahead in this field. At present, it is a choice of listening to those who make us believe that the blind are safer on machinery than the seeing, and in consequence watching them take undue risks, or finding them on menial labour because the foreman cannot imagine that they could possibly handle his machines, or developing a method that is obviously highly efficient.

By safety motions we understand :

- (1) Correct approach to moving parts and open tools ;

- (2) Elastic gripping and holding industrial material to prevent the soreness of fingers, which is more troublesome to a blind person than it might be to a seeing one ;
- (3) Keeping one hand out of the danger area whilst the other operates a tool. This can be achieved either by arranging motion sequences accordingly, keeping the endangered hand usefully employed while the other operates the machine, or determining a place on which the endangered hand should be placed before the machine is operated. But all this is only effective if it is built into the work rhythm as a separate step and practised until it has become a working habit. There is a last group of safety motions where the operation of a machine is made the response to tactile kinaesthetic signals in the endangered hand. This is built on the observation that in repetitive work the sense impressions are the same on every operational cycle.

USE OF EQUIPMENT

With regard to equipment, we have found that where the principles of motion study have been incorporated in the design, equipment enables blind persons as much as the seeing to get higher production : such principles as the elimination of search by replacing sight location by touch location, avoiding visual lining up of several components, the area of easiest reach, the field of free vision which also represents the field of unhampered movement, discontinuing the use of one hand as a vice and bi-manual tools encouraging simultaneous, symmetrical, rhythmic, slightly curved counter motions.

On account of the higher fatigue factor, muscular effort should be replaced, wherever possible, by mechanical means such as mechanical ejectors, clamps, feeding chutes, conveyor belts, and so on.

KINAESTHETIC HANDLING

On the basis of our observations on blind space perception, sensorial equipment and motion study, we are developing the tactile kinaesthetic handling method. We are assisting in the speeding up of perception—for instance, on the selection of components—by analysis of complex motion patterns of forearm, parts of the hand and the part each finger plays in complex motions, such as prelocation or loading, together with the manner in which the fingers should be placed on components to enable one hand to hold ensuring at the same time the necessary contact between component and equipment, the required measurements and to enable the fingers to find their bearings.

Another part of the tactile kinaesthetic handling method is the operation of machinery by vibration. The blind handling method has much in common with the method of the seeing operator when

INDUSTRIAL EMPLOYMENT OF THE BLIND



FIG. 4. Sorting and stacking laminations.

he has become skilled on a job, but this lies beyond the scope of this paper. I do not want, however, to imply that to employ blind people it is necessary to alter equipment. In most companies they work principally on existing equipment.

I think it might be useful to illustrate the method by a few photographs.

I am indebted to the kind assistance given by Mitcham Works Ltd., Machine Shop Magazine, and the National Institute for the Blind in permitting me to show their photographs.

What I want to stress is that it is not essential for blind people to assist themselves with one hand to find the place where the other hand locates something. Localisation is very exact. For a 60 M-Hour, loading time is 1.3 of a second and the operator in Fig. 1 did not make a 60 but about a 95 M-Hour and located and annealed 29,000 pins a day. The operator did not do this job for very long and has since been on three or four other groups of jobs. In Fig. 2, the photograph has been taken just after the operator has indexed. Whilst he is still finishing indexing with the left hand, he is already grasping the operating lever, ready to operate. Fig. 4 shows the handling method similar to Fig. 1, although the required location on the stack does not necessitate the same exactness as in the first picture. This operator is a man with a very low muscular sense.

In Fig. 5 the bulbs are to be sorted in six different sizes according to diameter. The daily output on this job was about 8,500 bulbs.

In Fig. 6 the piece part is not visible, but is indicated by the position of the operator's hand. The remaining fingers of his left hand are on the shutter ready to close it for operation. This is an exact imitation of what a good seeing operator would do on a similar job. Production requirements necessitate that the location movement of the right hand should go straight to the next piece without fumbling.

In Fig. 7 the left hand is holding the bag and feeling for the opening of the hem where the operator should start threading, whilst the right hand is holding a bodkin through which the wire has been threaded.

In Fig. 8, by pressing the foot-pedal the operator disengages two mandrels which have formed profiles. He slips the anode over one mandrel with the right hand (as illustrated in the photograph) whilst his left hand gets ready for the transfer of the next anode from left to right. The output of this man—on the first machine he had ever touched in his life—was 1,700 anodes per hour.

The job shown in Fig. 9 is one instance where a completely new method had to be developed. You see the operator holding the glass envelope of the bulb in her left hand and the assembly in her right hand. On top of the assembly is a very fine filament spring, and if that spring is knocked or even touched, the whole assembly



Fig. 5. Bulb sorting and diameter gauging. The right hand is gauging one bulb over one of the plug gauges, whilst the left hand is selecting the next bulb for gauging.

becomes a reject. When I first investigated the job everybody thought I had attempted an impossible task, because the way seeing persons operate is visually to aim the assembly into the glass envelope, and very often they knock off the spring. Forefinger and thumb on both sides, left and right, slightly overlap the rim of the bulb and assembly respectively. The operator's hands approach each other. The tips of the fingers meet and whilst the fingers slide past each other, the piece part, or assembly, slides safely into the glass envelope. It is interesting to note that the departmental head in the valve assembly department has determined that in future this should also be the method for seeing persons, because with this tactile kinaesthetic method there are far fewer rejects.

In Fig. 10, in the boss of the knob is a tapping hole, and this fixture is designed for sight location. This is an instance to confirm how in some cases, sight location can efficiently be substituted by touch location without re-design of equipment. There is no indication on the fixture or the piece part as to how the piece part should be placed so that the hole is centralised for the tap.

Both hands are holding the knob in Fig. 12, the right forefinger slightly overlaps; both touch each other, whilst the thumb and second finger of the right hand hold the piece part at the widest

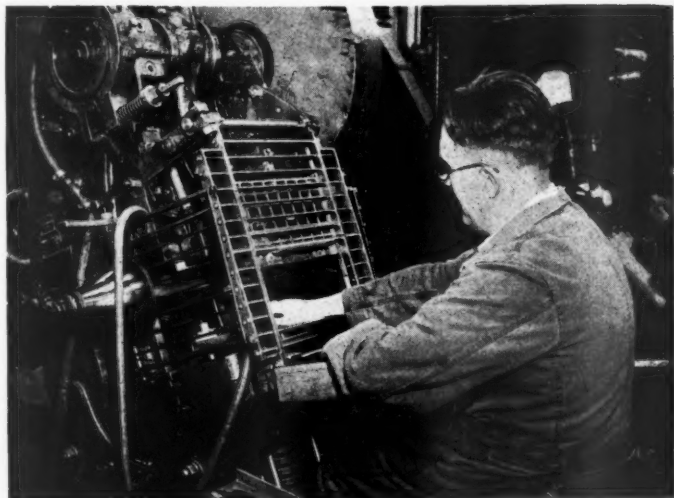


FIG. 6. A 12-ton inclinable press fitted with a Mitcham pre-closing, interlocking Guard. Operator is just locating the piece part with his right hand, whilst his left hand holds the next piece part between thumb and forefinger.

circumference, and give the blind person complete bearings to locate the knob with the hole centralised for tapping.

Fig. 13 shows that with the tip of the forefinger overlapping, contact can be made between piece part and fixture.

If you compare this with Fig. 11 (the knob location) you will understand that if the operator approaches the fixture with his right hand and the right forefinger overlaps, he can easily locate the slot in the fixture. The width of the slot is $\frac{1}{4}$ in. There is about $\frac{1}{16}$ th of an inch tolerance either side because the tap will pick the hole up, even if it is not quite centrally located.

One word only about safety : we have found that blind people are about as safe or unsafe on machinery as normal people. The constant awareness of their immediate surroundings which they try to keep up in their particular life situation has proved to be no added protection, and we have taken great care and gone into very thorough investigations, especially on the point of safety, with regard to the attitude of the seeing factory community of which I have spoken before. With regard to safety it is important not to discriminate against the blind to avoid feelings of inferiority and

INDUSTRIAL EMPLOYMENT OF THE BLIND



FIG. 7. Threading wire through the hem of a loud-speaker bag.

frustration. For this reason, it has become the custom in the companies not only to fit the machine of the blind person with more efficient mechanical guards if they have been found desirable, but all machines of that type in one department. In this way, the employment of the blind is in some small measure contributing to increased safety all round.

**JOB
ANALYSIS**

We have found analysis very useful—more useful than surveys, because in the latter those details which make all the difference between the suitable and unsuitable type of job are very often overlooked. We analyse the physical, mental, sensory and mechanical requirements, including safety, and this is the kind of analysis which we suggest should be made the basis of all efficient training in industry.

With regard to the blind, the criterion by which we measure suitability is whether the job, in all its details, can be controlled by the blind on the basis of their mental, sensory and physiological equipment on the existing lay-out and machinery as efficiently and within the same time as by the seeing, giving the same quality without incurring additional physical hazards, without causing undue muscular or mental effort, and without additional supervision. Jobs on which vision can be substituted by touch, the impressions from moving parts of the body and hearing, usually constitute suitable work.

With regard to types of work, machinery and operation, I have found it quite impossible to classify them because too much depends on the kind of tool, machine, guarding, and the component. Suitability is closely connected with usefulness for the department. A single job in a department may be suitable, but would never be useful. To give usefulness, the blind are trained on groups of jobs—up to thirty jobs at a time. Even so, they are greatly restricted in comparison with the seeing, and a constant watch must be kept on changes in the production programme and methods; transfer and retraining are frequently necessary.

**GOVERNING
PRINCIPLES**

The following principles govern the employment scheme and training :

- (1) Neither blind education and welfare nor industry have so far recognised that the capacity for continued exercise with very accurate timing is a skill of a high order. Machine operation demands an accuracy of perception, judgment and minutely timed precision of bodily movements, and this precision must be repeated with high speed for long periods of time. In the face of such great demands, work and training should be strongly motivated.



FIG. 8. Rolling anodes on a power-driven foot-operated bench fixture.

- (2) Man being essentially a visual creature, every bit of knowledge of advanced production methods and industrial and blind psychology should contribute to offset the loss of sight.
- (3) In the interest of mental health and to further satisfactory personality adjustment to the particular handicap of blindness or partial sight, the same economic, social, psychological, welfare and production conditions should operate for the blind as are in force for the seeing. As, in their own interest, e.g. to accomplish satisfactory rehabilitation, we expect the same return from them as we do from the seeing, their conditions of employment should be identical.
- (4) To counteract feelings of frustration or inferiority at the best, or at the worst the development of undesirable attitudes and tendencies, it is very important on repetitive and monotonous work to maintain a constant mental effort. *The Means*: Treating every operation as a skill, even packing, and to stimulate through training those mental processes that can be brought to bear on even the simplest operation. All those motivating incentives to work which operate for the seeing, are also operative for the blind members of the working group. In addition, we



FIG. 9. Bulbing—inserting valve assembly into glass envelope.

have in our training utilised the incentive in the operator-job relationship of which we feel more use should be made also in the training of seeing workers. It is the enjoyment we can derive from doing efficiently what we can do. Our training is based on the satisfaction that we educate operators to derive from the employment on the job of their physical abilities, their whole sensory equipment, and efficient thinking—this is only possible on good equipment, provided by the production engineer.

In the companies, the blind are employed under the same conditions as everyone else. They are expected to make the same rates—all production work is on piece rates—to have the same output, and the same quality, as the seeing. The management has, however, decided on a very important concession. Only the blind get four weeks' training, during which time their wages are paid by the Personnel Department and not by the Production Shop for which they are trained. They are trained to accustom themselves to machines which most of them have never before touched. They are trained on a group of jobs which is considered suitable for a particular blind individual. After four weeks, during which time they usually attain the required speed on the jobs, they are employed as



FIG. 10. Tapping fixture usually set up in a foot control Haskin's tapping machine with a wireless knob already in position, ready for tapping.

ordinary operators. The blind and the partially sighted receive training which is specialised for each category and these are some of our results.

The blind and the partially sighted compare favourably in output and quality of work with the seeing. They make at least time-and-a-third and more than half of them make time-and-a-half on groups of jobs ; this achievement is particularly remarkable for the partially sighted, as all over the country their output is lower than that of the totally blind or the seeing.

Blind and partially sighted rank among the best wage-earners in the companies and they have only insignificantly more waiting time than seeing operators.

In the majority of cases there has been a marked improvement in adjustment to the physical disability, and in several cases increased facility in making social contacts. Those who had finally to be discharged after an employment period of between two to twenty months did not fail in their industrial achievement, but in their personality adjustment. The mobility of the blind and their usefulness to the department is by far more restricted than that of the seeing. In all cases where suggestions have been made to adjust or re-design equipment or methods, not only the blind have benefited and their production has gone up, but the increase of production has been universal for the blind and for the seeing. One of the most important results is that within four weeks this industrial training can give blind people a job which provides a better livelihood than anything blind people have known before in their traditional trades, and more enjoyment than they have ever attained from caning chairs, making baskets, brushes and so on.

I personally attribute the comparative success of this scheme to the following factors :

- (1) The thought and careful preparation which was given to it prior to its introduction, especially the manner in which the idea of employing blind people was sold to the production shops ;
- (2) The employment of the blind on the same terms as the seeing ;
- (3) Receipt of intensive training which the seeing operators are not given. I mention this because the output—the M-Hours of our blind operators—is very high. I think, however, that if our seeing operators were to have the same kind of four weeks' training the blind would find it rather difficult to compete with the seeing ;
- (4) The close interdepartmental co-operation between production shop, personnel department, the trainer, the safety officer (who has a very important part to play in this scheme), and the welfare officers ; the engineering methods departments with its tool room and its maintenance department, time study and medical department. We also



FIG. 11. Knob held during selection by left hand at the moment the blind operator has located the hole.

have the co-operation of the Trade Unions and shop stewards ;

- (5) The dependence of blind people on co-operation within the department in which they are employed. Without it blind employment would be impossible ;
- (6) The presence on the premises of a special part-time instructor who also acts as interdepartmental liaison.



FIG. 12. Moment of Transfer—left hand to right hand.

**DIFFICULTIES OF
BLIND EMPLOYMENT**

The following facts indicate that blind employment has its difficulties. After thirty months of blind employment in five departments with fifteen shops, there are still many foremen and supervisors in the companies who are convinced that in "their" shop and in "their" section blind people could not possibly work their machines. Although there are several hundred operations which have been found suitable, we find it often very difficult to get blind people the necessary work. It is very important to remember that to make just

"ordinary" operators out of the blind, a great amount of extra time, work and money has to be contributed by a great number of people.

With regard to expenses for an instructor-investigator, an extra expense which, incidentally, American industry pays for the same purpose in respect of all kinds of disablement, such expenses are more worth while for a company which accepts its social responsibility towards the community, than the extra expenses paid at present by most firms in this country in giving additional time allowances, accepting a lower return, providing special equipment, special seeing assistance and so on. By providing special training and using the money for method improvement instead of for concessions to the blind, employers help not only the blind, but they help all their employees and themselves.

CONCLUSION In summing up, we state that the results of the employment scheme on which I have reported so far suggest that in short cycle repetitive work, even in firms with highly organised production, blind and partially sighted persons can, on a large variety of operations, attain an achievement that should compare favourably with that of seeing workers. Such achievement is only possible if based on specialised training which combines blind psychology, industrial psychology and up-to-date production methods. The usefulness of the blind employees, however, will always be limited in comparison with that of the seeing, as they are only efficient on suitable work.

We believe that it is in the interests of the blind as well as of industry that they should be introduced to industry by virtue of the true assets which they possess for repetitive work, and not be recommended on the ground of abilities and traits which they do not hold. Loyalty and conscientiousness, for instance, on the part of disabled persons, are based on feelings of inadequacy, insecurity and dependence on the goodwill of the employer. This is not a sound basis for a successful personality adjustment, and I do not think it is a pleasant situation for a conscientious employer.

The real significance of this employment scheme is the fact that industry, and particularly the two companies which have carried out the first investigations into the blind method of industrial work, have done more for the blind within the last four years to make them independent, and give them a livelihood, than has been achieved within the last 150 years by society as a whole.

The significance lies not so much in the proof that the blind can stand up to the highest production requirements, important though this is for the future of the blind as a group, but in the number of cases of better personality adjustment to the disability. If there is something in the scheme of which the management of these companies, responsible for its running, can rightly be proud it is that

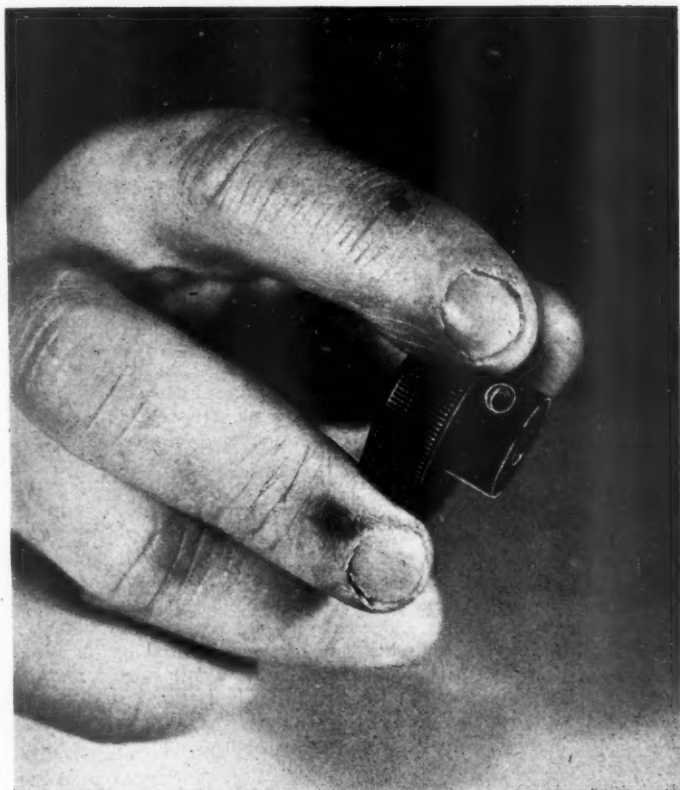


FIG. 13. Right hand carrying knob towards fixture ready for location.

our blind are not particularly good timekeepers, not good boys and girls, and stand up for what they consider to be their rights. These are some of the instances which signify a better adjustment to the disability.

These companies have been the first to realise that occupational success and efficiency are some of the important factors for personality adjustment, and foster a fuller and happier life for the disabled. They have been the first in the country to introduce specialised training for the partially sighted and have proved that this group of the disabled can be just as efficient in industry as everybody else. Following their lead in publications and talks, the expression

"partially sighted" has replaced that of "blind" or "partially blind" more and more, thus raising the hope that in the near future the partially sighted will no longer be trained, educated and treated as though they were blind. The number of blind persons suitable for employment in open industry is small. There are about 40,000 blind and partially sighted persons between the ages of 16 and 65 in the country. It is not known how many of these have complementary defects and are only suitable for sheltered employment. At present there are only 500 blind people seeking employment on the books of the Ministry of Labour.

Job analysis is an essential tool for the useful employment of the blind as it is for all categories of disablement. It should not be left to individual employers, but should be carried out by the Ministry of Labour. The Ministry should publish a manual not containing broad statements that have only publicity value, but containing suitable jobs for each category of disablement in terms of tool design, mechanical guarding and operational methods. I hope these will be some of the recommendations of the Working Party of the Ministry of Labour which is at present investigating industrial employment of the blind.

If all we know about the employment of the blind and other categories of disablement is used, their employment in industry need no longer be a problem. Much, however, is left for those responsible for educating and training the blind which could not and should not be done in industry. This education to prepare blind people should be based on the development of their physical, sensory and mental abilities. They should be trained in the tactile kinaesthetic method at the schools and training centres for the blind and the partially sighted. Such training would naturally include becoming more independent in little personal things in life and moving about by themselves. If this training was in operation much more seeing labour, which is at present wasted in assisting the blind in industry, could be saved.

Blindness is not the mere lack or impairment of a single sense, but changes and reorganises the entire mental life of the individual. This is why a literary education is no longer sufficient for the blind, and training them as the seeing does not give satisfactory results. For this reason investigations such as those of which I have spoken—searching for the blind way of doing industrial operations—has such great significance.

DISCUSSION

MAJOR THORNE, Director and General Secretary of the Institution, said it was unfortunate that Mr. T. B. Worth, Education Officer to the Institution, was unable to be present because, as they were aware, he was an enthusiastic authority on education and was

greatly interested in this particular aspect of it. He had, however, sent a note on the educational implications of training the blind for industry.

The problem, said Mr. WORTH, essentially demanded a completely new approach, and he thought one of the most important aspects was what for want of a better term he would call initiation training, which Dr. Fuchs had emphasised. Such training must essentially make a blind person feel that his training would follow a recognised pattern which, though different from that of sighted people, was of a similar or even higher standard. This demanded a psychological approach, and the work of Dr. Fuchs had undoubtedly contributed very greatly to the knowledge of this subject.

The second point Mr. Worth made was that in developing this rather different approach, one might possibly simply call upon a fundamental principle of training which could be applied to everybody. Again this was in line with what Dr. Fuchs had said. This was particularly true in the fields of such techniques as motion study; he thought he could safely say that it was with respect to them that motion study was applied very efficiently.

With regard to the industrial applications, Mr. WORTH stressed the importance of initiation training, and it was his firm belief that training on the lines outlined by Dr. Fuchs would result in a high contribution to production by blind persons. It was an accepted fact, he said, that the loss of one faculty was often accompanied by a complementary increase in efficiency in some other faculty. Here, MAJOR THORNE said, he would like to add his own observations. He had seen wherever he went in the world that the loss of some faculties had very often resulted in a moral courage which people with all their faculties might well adopt.

Mr. WORTH, continuing, said in his note that this had resulted in first-class craftsmanship from the blind. From a safety point of view, there was reason to believe that investigations as to the control of a machine for operation by a blind person had resulted in the development of a safety device which could be built on all machines of that type and for this a debt was owed to investigations such as those outlined in Dr. Fuchs' paper.

Mr. D. F. HUTCHISON had been associated with Dr. Fuchs for several years and knew something of his work. He congratulated him most sincerely on his unusual and excellent paper. He was very happy on this public occasion to tell Dr. Fuchs that his work and achievements were an example which some people with less obvious handicaps would do well to emulate. He was doing original work and making progress on it. It was to be hoped that he would continue to receive the opportunity and assistance that he needed and that he so very richly deserved. This aspect of the training that Dr. Fuchs had been talking about surely represented the sort of

way in which the country could increase its efficiency if the same principles were only applied to a very much wider field.

Dr. Fuchs had said a little about the myth of blind people acquiring greater acuteness in some other sense. But was it quite the myth he suggested? The last speaker had mentioned what he had in mind—that when, for instance, one was listening to music and trying to read one could not do both very well, but if one could not listen to the music, one could concentrate on the reading, and *vice versa*. In other words, if a certain sense was debarred to one, one developed the others.

He had been very pleased indeed to hear Dr. Fuchs touch on a most important aspect of the problem—the total number of disabled. There was a tendency to think of blind people as something apart and different from other disabled people. He had tried to point out that all were disabled in some way or another and should not adopt an attitude of “We have to help the blind”. It had been proved that the blind did stand on their own feet and got on very successfully.

The remarks of the training officers—that the four weeks’ training which seemed an additional cost was really no cost at all—were very pertinent. Dr. Fuchs had not stressed the cost factor of modifications to the job though he had touched on it. But did everybody grasp the significance of his comment that if something had to be adapted owing to an improved method of technique, it was applied to all the sighted people and was only done if it was a sound economic proposition?

DR. FUCHS did not agree with the example about music, because he had found, in the twenty-five years he had spent in blind education and training, that although one could not see, one was ordinarily distracted much more than the seeing person, by little sounds which might not be apparent to other people.

With regard to costs, he found that these additional costs would always remain with industry if industry was going to employ disabled persons on a high production level in the future. There were, however, ways and means in large industrial concerns of bringing the extra costs down to a minimum, because a training officer investigator could at the same time be employed in the personnel department, in the motion study department, and in the methods department, doing useful work which had nothing to do with the disabled themselves.

MR. HART thought the costs business was a complete fallacy. There were no extra costs in training a blind person. He thought study with regard to blind persons should begin by the selection at the interview when they were engaged. If two people, one blind and one not blind, but both inexperienced, were taken on it would, he thought, take roughly the same amount of time to train them.

Because industry was not very particular as to the engagement of labour, there was a tendency to let the shops select and reject labour and so to run up costs. He must reject, wholly and solely, this cost argument, which was unfair to the blind.

MR. R. HUTCHESON said it was in the middle of 1943 that he first came in contact with this problem when he was at the Ministry of Labour. He had been surprised, in the works he had visited, at what blind people were doing, but it was obvious that the jobs had to be selected for them. Another thing that had really amazed him was their motion-mindedness. It really seemed that if one had to "motion-study" a job, there was no need to employ a motion study man. The blind men soon found the quickest way round, and were very methodical workers.

All the changes that were made in tools and layouts for blind persons were only what should be done for sighted persons.

MR. GROTSCHINSKY asked if any use was made of high quality electronic devices—push button controls, relays of photo-electric cells and so on—in order to use the blind on the more specialised work? In some industries, seeing people had to work in the dark, for instance on the production of photographic plates. Was use made of blind people in similar cases? A small fixture where fingers located a hole to be tapped had been described in detail. If one used a kind of pin or tommy bar for locating the hole, might it not be quicker and more accurate?

DR. FUCHS said that so far very little money had been spent on research to widen the scope of blind people's work in industry. An American ball bearing producing firm had developed an electronic gauge on which they employed—or had employed two years ago—about thirty blind people. He had himself pointed out that electronics would offer the auditory means and the push button means to give blind people much wider scope than they had at present in industry.

In the companies concerned there had been investigations on how blind people could be trained in skilled labour. These companies were the only ones in the country which had spent a considerable amount of money and a very considerable amount of time and experience in investigating blind employment. Much could be done, for instance, in training blind people as skilled capstan operators and turners. For this, capstans would have to be fitted with devices which would prove equally useful for the blind and the sighted, because much of the strain could be cut out if fine limit capstan work could be done by touch or hearing and not exclusively by sight. Although this required money, it would be possible to train efficient, intelligent blind persons for close limit capstan work and as turners.

In America blind people were trained very efficiently on servicing radio sets by a blind man who, incidentally, trained American

service personnel during the war in servicing wireless sets in jungle conditions and complete darkness. This was made possible by a development of testing apparatus which was partly tactile and partly auditory. But it was found on the production line that blind people could not keep up the required speed, for instance in fault-finding. A very profitable line for the future for blind individuals would be to open wireless servicing shops.

Two blind operators in the companies did wireless repair work at present in an efficient way and supplemented their earnings by doing so. Blind people were only quick enough where the motions were very simple and straightforward and where little skill was required. Hardly any experiments had been carried out with blind people employed in dark-room work, although these would prove a full success.

With regard to the little wireless knob, the suggestion of the last speaker went against all motion study. When a component had to be picked up from a container where there were hundreds of such components, lying in odd ways, blind people who were trained did not use the seeing way, grasping a component with thumb and forefinger. They brought all fingers to bear on the component. By so doing they felt the hole at the moment they grasped the piece part. They had then to keep their finger on the hole for the transfer. If they were to use a rod, they would be slower because they would have to pick it up.

MR. GROTSCHINSKY suggested that there might be two separate operations.

DR. FUCHS agreed that this would be possible, but added that it was contrary to a very important principle of the companies for which he worked. Whether their methods were good or bad was another matter; some were probably good, some bad. However, it was not the custom to break down operations for the sake of the blind. They simply had to work on the operational conditions existing in the firm, unless there was a very good reason to change an operation and break it down in order to speed up production generally.

MR. CUMMINGS asked whether Dr. Fuchs could give any guidance as to the possibility of blind people grinding cutting tools and drills. He would also be glad if Dr. Fuchs would enlarge a little on his expression "space perception".

With regard to blind persons going into factories where probably no blind person had ever been before, it struck him that there might be some reaction on the part of the blind person to the way in which he was accepted by the other employees in that firm. That was to say, they might be well-meaning and want to show him certain things, but he might not want to be shown them, or want to be shown in quite a different way.

DR. FUCHS said, with regarding to grinding cutting tools and so on, that in a shop which had many drills to grind this would be an excellent job for blind people if a fixture could be made for them to hold the drills. It could be done very efficiently. Very fine angles had to be observed. Grinding cutting tools was a field of work on which he would like to start investigations.

With regard to the introduction of blind labour into a firm, this was a very important matter. At Mitcham this had been achieved by the trainer working under operator conditions in many departments, thus selling the idea of employing blind labour in the production shops. His salary was carried by the Personnel Department so the production shops regarded his output as a present.

With regard to training, he had found that some people had a bent for education and training. There were men in industry who had never seen a blind person but were able to train the blind perfectly.

Blind people, when they came into industry, had a tendency to think the world of themselves if they did the job half as quickly as was required. It required some tact to say to them "I think this is very good, but not quite good enough yet".

Space perception on the job meant that the blind worker must perceive the shape of his machine. He must know the exact location of the machines. He must know the shape of his tools and must know the "space" or shape, the outlines, and the relevant elements of the piece parts. He must know all this in relation to what he has to do with the piece part on the machine or his jig or his layout. The piece parts lay in a container, and the blind person in selecting the piece part must realise which way it lies and which way it has to be turned to be worked upon. For that, he need not perceive every detail, but only the relevant elements.

There was evidence that the speed of clasping a piece part with one hand (narrowest perception) was almost as quick as visual perception. The larger the piece part to be perceived, the more time it took to perceive it by touch, and therefore very large piece parts were not to be perceived within the rates based on visual perception.

MR. JOST said that some years previously he had been taken over a factory which was making comparators for the use of blind persons. The blind inspector passed the parts he was inspecting under the comparator plunger. When a part was too large in diameter a high-pitched bell rang. If the part was within the limits specified, two bells rang together. Up to the present, this had been considered a very good instrument for the use of blind inspectors. After hearing Dr. Fuchs, however, he wondered whether this job—being a hand job, an inspection job, and perhaps on production lines a monotonous job, was really ideally suited to blind persons.

Secondly, could Dr. Fuchs say something about the attitude of the factory inspector on the guarding and fencing of machinery to be used by blind persons?

Finally, a word about Dr. Fuchs' radio knob. Perhaps if a large quantity of these had to be made—as appeared to be the case—a small automatic fixture could be designed which would dispense with sighted as well as blind operators.

DR. FUCHS said he considered the comparator referred to a very efficient instrument for blind persons. Full inspection, as it became rarer in industry, was replaced by quality control. There would always be jobs which would need 100% inspection, but their range became smaller with higher production efficiency. During the war, inspection by comparator was used for a wide range of work, although it was very monotonous. He would not say the blind liked it, but they did it very well and stuck to it for very long periods. If there was a job where a blind person could be employed on a comparator he should by all means be employed.

With regard to the reaction of the factory inspector, he thought that if the blind person had been given a good training and reasonable precautions had been taken, no factory inspector would take the line that there had been gross carelessness. Many of the standard Home Office guards were not efficient for seeing people. They could not, therefore, be efficient for blind people. It was advisable to "go slow" in extending the range of work for the blind with regard to safety, as blind employment was not only a science but also a policy.

There were two reasons why the wireless knob was not an automatic job:

- (a) Very few of these knobs were produced;
- (b) The radio industry was in a difficult position.

If the knob was really one on which anything like mass production was required, it would, in the companies, be produced automatically.

THE CHAIRMAN said that he would like to thank Dr. Fuchs personally, as Chairman, for his unique lecture. One thing had rather shocked him; he understood from the lecturer that there were 40,000 blind people in this country. This meant that taking the people who were gainfully employed, there were roughly some 10,000 people working for their living. On that basis, one in every 250 was blind.

He could not help feeling something should be done on a much wider basis—as Dr. Fuchs had said, he went to Mitcham prepared to spend two years convincing them that something could be done with blind workers in industry. As had been mentioned earlier, an American company had a policy of employing a percentage of

people who had several forms of disability, people with one arm, or one leg, blind people and so on. That was a sure argument of their worth. He was sure it could be done in this country, and it should not be left to the enthusiastic people, such as Dr. Fuchs and certain companies, to carry out.

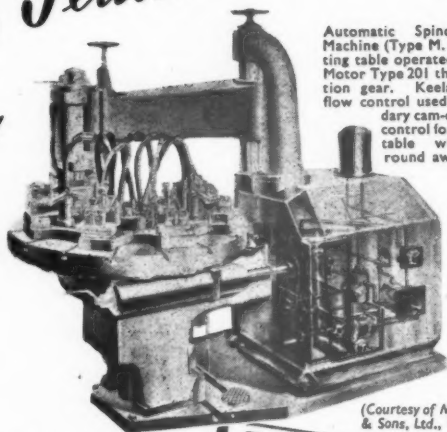
MR. BURNETT said it gave him great pleasure to move a vote of thanks to Dr. Fuchs for a most interesting paper. Before doing so he would like to emphasise that during the discussion—among all the points that had been raised—they had all to some extent lost sight of the other inefficiencies in industry and in the engagement of labour. In the present conditions of shortage, he was afraid they often put up with very inadequate labour because it was apparently the only labour available. Little attention had been paid to the possibility of utilising more effectively material that at first appeared to have disabilities. Furthermore he agreed, virtually, with the suggestion that industry must have a social responsibility for this problem.

The proportion of blind people to people with vision was high. At the same time, it was a very small proportion of the people who should be employed in industry. He felt the factor of social responsibility should be taken up more actively by industry itself so that people with such disabilities might enjoy a full life. He would like to ask one question about the conditions regarding employment of blind people in a works where they had to be taken to their particular jobs, and whether in a particular factory it was considered desirable to have one operator working in a department, or whether it was not better to try to have a group. The particular conditions of work he had in mind were very far from mass production, and the class of work required would be rather limited in its particular applications.

DR. FUCHS, in reply, said it was one of the headaches of the moment that in industry at present so much seeing labour had to be expended in assisting blind workers. Blind people—if they were efficiently trained—were very well able to walk about by themselves, but most blind people who could be employed at present in Great Britain were not able to do so. They became efficient only when they sat in front of their machines and started work although there were, of course, exceptions.

It was advisable not to place blind people in one department, but to spread them as equally as possible over all departments, because that made the position of the foreman much easier in finding suitable work for them. It also gave them great pleasure to know that for the first time in their lives they were mixing entirely with seeing people and were thus able to make new friendships.

Non-Pulsating Fluid **POWER**



Automatic Spindle Moulding Machine (Type M. A.) with rotating table operated by Keelavite Motor Type 201 through a reduction gear. Keelavite Patented flow control used with a secondary cam-operated speed control for slowing down table when profiling round awkward shapes.

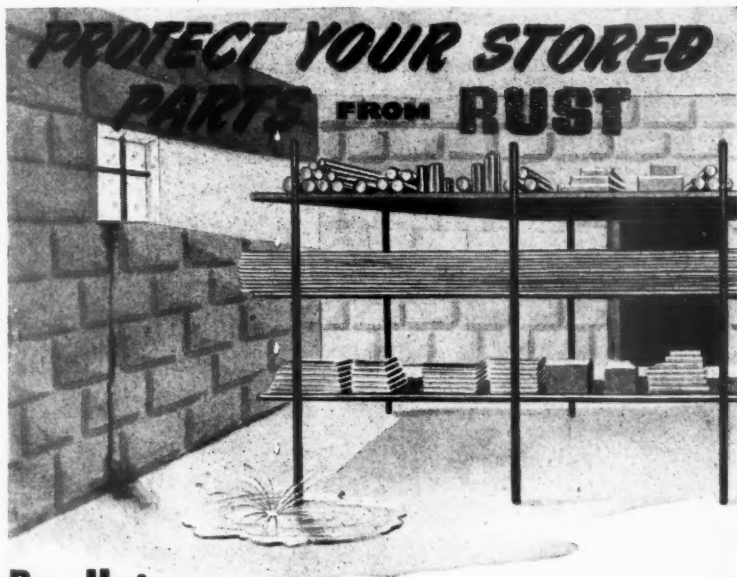
(Courtesy of Messrs. Thos. White & Sons, Ltd., Paisley, Scotland).

This is but one of hundreds of applications of Keelavite Hydraulic equipment designed for the job yet the circuit is built up from Standard pumps, valve gear etc.

Keelavite Hydraulics

If you have any kind of problem demanding the flexibility of non-pulsating fluid power our designers can solve it - in all probability from Standard Units.

KEELAVITE ROTARY PUMPS & MOTORS LTD. ALLESLEY, COVENTRY



By Using

FERROMIDE REGD.

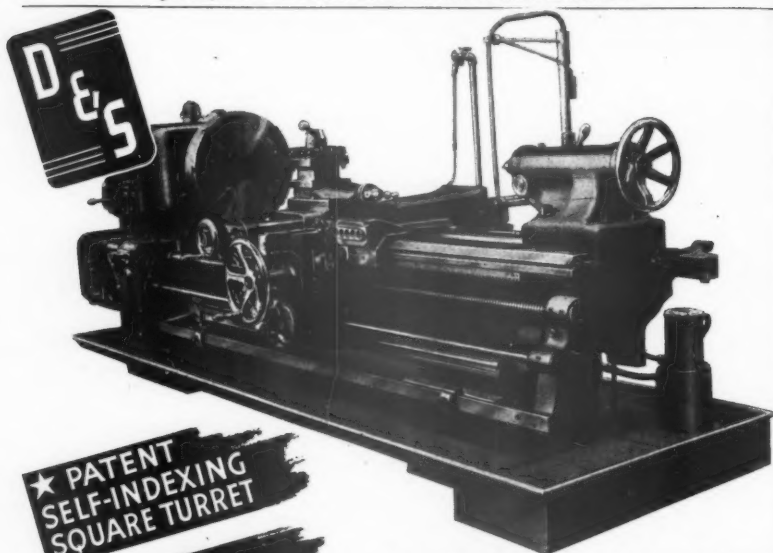
PRODUCTION PROVED PRODUCTS



ELECTROLYTE WORKS, 9A LADBROKE GROVE, LONDON, W11
 PHONE: PARK 6564-6969 4 GRAMS: SUNANTICOR, PHONE, LONDON

WRITE FOR ILLUSTRATED LITERATURE
 SPECIALISTS IN INTERMEDIATE METAL PROCESSING

IPE.2



★ PATENT
SELF-INDEXING
SQUARE TURRET

★ PATENT
QUICK POWER
SADDLE TRAVERSE

★ PATENT
FORCE FEED
LUBRICATION

★ QUICK ACTING
MULTI-TOOTH
CLUTCHES

★ COVERED
BEDWAYS

DARLING & SELLERS 10½" Centre LATHE

This lathe worthily takes high place in the machine tool aristocracy as a perfect example of the highest standards of British craftsmanship. Designed and built for faster production for longer periods, the D. & S. 10½" centre Lathe can fully justify its installation in any modern machine shop.

* The illustration shows a D. & S. 10½" Centre Gap-bed Lathe without Rapid Power Traverse.

Details and descriptive matter on application

Sole Selling Agents

THO? W. WARD LTD
ALBION WORKS · SHEFFIELD

TELEPHONE 26311 (5 LINES) · TELEGRAMS 'FORWARD' SHEFFIELD

LONDON OFFICE: BRETTENHAM HOUSE · LANCASTER PLACE · STRAND · W.C.2

NORTON Grinding Wheels enable the most exacting requirements of centreless grinding to be met satisfactorily. These wheels can be fitted to specific jobs to give :—

RAPID, FREE CUTTING ACTION.
LONGER WHEEL LIFE.

MORE PIECES PER DRESSING.
LESS REJECTIONS.

INCREASED RATE OF
PRODUCTION.

Illustration shows the grinding of bottom bracket axles at the rate of 720 per hour with Norton wheels.

Norton specialists will be glad to offer advice on the selection of wheels for the work to be done.

NORTON WHEELS

*for
centreless
grinding*



NORTON ABRASIVES

FROM

Norton Grinding Wheel Co. Ltd., Welwyn Garden City
OR ASSOCIATED COMPANIES IN SIX COUNTRIES

Alfred Herbert Limited, Coventry



LONG and SHORT TWIST DRILLS

Are often essential for practical purposes. It may be that reach is required to the drilling surface or conversely you might be working in the confined space of an automatic

We normally stock Straight and Taper Shank EXTRA LONG DRILLS from 1/16" diameter x 6" overall to 2" diameter x 36" overall length. These drills have Straight Shanks for sizes 1/16" to 1/2" diameter and Morse Taper Shanks for sizes 1/4" to 2" diameter

Short drills are made with Straight Shanks as STUB DRILLS, and are normally carried in stock from 1/32" to 1 1/2" diameter.

Ask for Illustrated leaflet of sizes and prices

DORMER TWIST DRILLS



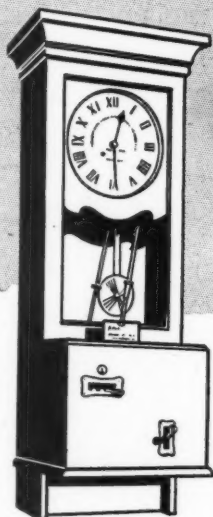
THE SHEFFIELD TWIST DRILL & STEEL CO LTD

SHEFFIELD 11 · ENGLAND · PHONE 24137 (5 lines) · GRAMS "PROELLS" SHEFFIELD.

LONDON OFFICE: QUEEN ST. PLACE E.C.4 · PHONE CENTRAL 7235 · GRAMS "PROELLS" LONDON

MANUFACTURERS OF TWIST DRILLS · REAMERS · END MILLS · COUNTERBORES · SMALL TOOLS

DORMER TOOLS ARE OBTAINABLE FROM YOUR USUAL ENGINEERS MERCHANTS



TIME is MONEY

The Gledhill-Brook Company was intimate with the early problems associated with the design and production of time recording machines, and was first in producing efficient electric impulse recorders with accurate time-

keeping free from dependence on electric frequency or external influence. Wages and cost methods have a time basis—that is where we are concerned to help.

A large number of time recording models is now available covering most of the known needs for wages and labour cost control. One of industry's immediate needs is the reduction of waste—the waste of time that costs money.

GLEDHILL-BROOK

TIME RECORDERS

GLEDHILL-BROOK TIME RECORDERS LIMITED
20 EMPIRE WORKS HUDDERSFIELD

SAMUEL GILL & SONS

(ENGINEERS) LIMITED
LYTHALLS LANE, FOLESHILL
COVENTRY

ENGINEERS
TOOL MAKERS
JIG AND TOOL
MAKERS

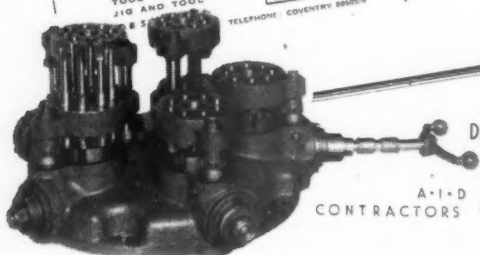


TELEPHONE: COVENTRY 8800/6

JIGS, GAUGES
MACHINE TOOLS
MEASURING
INSTRUMENTS



- JIGS • TOOLS
- GAUGES •
- MACHINE
- TOOLS •
- MEASURING
- INSTRUMENTS



DESIGNERS *and*
MANUFACTURERS

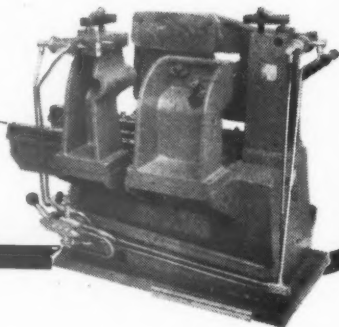
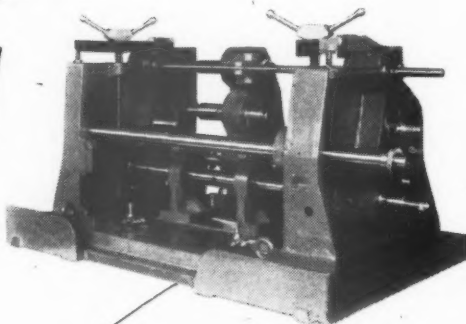
A-I-D APPROVED
CONTRACTORS TO H.M. GOVERNMENT

*Quality
Tools*

FOR THE



AIRCRAFT
COMMERCIAL
VEHICLE
AND
MOTOR
INDUSTRIES



AND SONS

This Wickman Equipment can help you to get the best out of carbide tooling

The important increases in output and efficiency that may be obtained from carbide tooling can only be maintained if the tools are correctly serviced. Wickman's with a wealth of experience in the use and application of Wimet Tungsten Carbide tools, specialise in grinding equipment for carbide tool maintenance. Full details of these machines, and useful information on the selection of grinding wheels is contained in a new publication "Tool Grinding Equipment." Send for your copy today.



WICKMAN AGATHON Grinding and Lapping Machine. For the precise grinding and lapping of small tungsten carbide tools. Employs two double-sided wheels and has micrometer controlled feed.

WICKMAN Grinding and Lapping Machines. For the off-hand grinding of tungsten carbide tools. In two sizes—model 14C with two 14" grit or diamond wheels to choice. Model 8B with two 8" wheels.

WICKMAN Optical Profile Grinder
Grinds form tools, punches and die segments direct from drawing. Microscopic control during grinding assures accuracy of the most intricate contours.

NEVEN Bench Tool—Grinding Machine. Designed for universal cutting—tool grinding. Quickly adapted for grinding end-milling cutters, reamers, etc.

WICKMAN NEVEN Bench Tool Grinding and Lapping Machine. Ideal for the small workshop, for the off-hand grinding and lapping of tungsten carbide tools.

Send for this new Catalogue today !

A. C. WICKMAN LTD · COVENTRY · ENGLAND
LONDON · BRISTOL · BIRMINGHAM · MANCHESTER
LEEDS · GLASGOW · NEWCASTLE · BELFAST

A.C. Wickman LIMITED



G.P.A. TOOLS & GAUGES LIMITED

HARPER ROAD WYTHENSHAW • MANCHESTER
 PHONE : WYTHENSHAW 2215. 61 X 6

[GRAMS PNEUTOOLS, PHONE

*We can now
 accept your enquiries
 for*

JIGS • FIXTURES & GAUGES

PRESS TOOLS • MOULDS AND
 SPECIAL PURPOSE MACHINES

of all kinds



Up-to-date shops specially laid out and equipped for making, on a production basis, every type of precision ground gauges; limit snap, form, calliper, taper and special purpose gauge, as well as jigs and fixtures of all kinds, press tools, moulds and special purpose machines. Highest class workmanship and accuracy guaranteed.

G.P.A. TOOLS & GAUGES LIMITED

Guaranteed Precision Accuracy

Members of the Gauge & Tool Makers' Association

They're talking
again about
**PRESSURE
DIE-CASTINGS**

This time
it's about
COVER PLATES



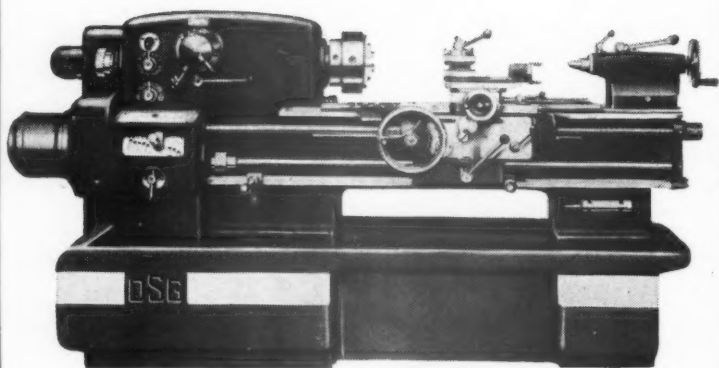
ALL HOLES AND DIMENSIONS CAST TO CLOSE LIMITS WHEN REQUIRED

WOLVERHAMPTON DIE-CASTING CO. LTD.

GRAISELEY HILL WORKS WOLVERHAMPTON

For High Class Production or Toolroom Work

TYPE 13



13" SWING PRECISION LATHE.

from our
New Range
13" to 30" Swing

Flanged Vee Rope Motor Drive
Self-Adjusting Clutch
Middle Bearing to Spindle
Final Drive to Spindle by Vee Ropes
Patent "Fastlock" Spindle Nose
Wide Range of 12 Spindle Speeds
Wide Range of Threads

CATALOGUE and
PARTICULARS on request

Dean SMITH & Grace Ltd
THE LATHE PEOPLE
KEIGHLEY ENGLAND

The Sturdy KENT-OWENS HAND MILLER

BALANCED head mounted on two steel posts ensures chatter-free operation. Head is counter-balanced by an adjustable coil spring. Table hand lever is readily changed from front to rear, similarly the head lever can be set for either front or rear operation, both levers are adjustable for length.

Table 25" x 9" - Table Travel 10" - Table Travel for 180° of Hand Lever 4½" - Vertical Feed of Head by Lever 4" - Total Head Movement 7" - Cross Adjustment 2½" Spindle Speeds 20 - 1666 R.P.M.



IN STOCK

COMPLETE WITH SPINDLE MOTOR,
SUCTION PUMP and ARBOR.



INSPECTION IN LONDON OR WILL
SEND ON APPROVAL.



Also available with Hand Movement to Table
Only, in which case Head has Micrometer
Adjustment of 7".



CATMUR MACHINE TOOL CORPORATION LTD.

WHITEHEAD HOUSE, 247-9 Vauxhall Bridge Rd., LONDON, S.W.1

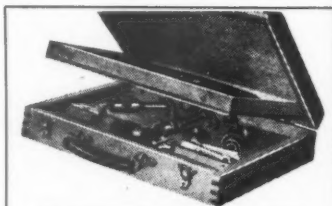
Telephone : WHitehall 0094-5 (Extn. 4 Mr. Langley)

The Broomwade Air Force *will speed production*



Engineering ingenuity has always striven to produce mechanical aids to increase production. To make better products, make them faster and at reasonable cost, yet retaining the typical British reliability, will always remain a problem for designers and engineers.

More and more industries are discovering the advantages of compressed air power and the Broom & Wade organisation, specialists in compressed air engineering for 50 years, now produce equipment for use in every industrial field. Broomwade pneumatic tools are as good as British workmanship and materials can possibly make them, and these are the tools which are backing up the production effort of the country—helping to produce more, better and cheaper goods.



3 tools in 1. The Universal "Supermite" outfit, comprising straight drill, right angle drill, die grinder. A handy kit for light engineering duties.



The "Broomwade" Air Motor Hoist, operates by a unique, crankless, air motor, providing a lift up to 15 ft. with previously unattained economy, and it is reliable and safe. Other features include automatic protective cut-off at top and bottom positions, automatically applied brake when controls are released, wire rope positively guided on drum—rollers prevent riding off. Hoists are made for 15cwt. and 20cwt. loads.

Here is one of our DX range of Chipping Hammers—the DX5. A new type of plate valve provides higher efficiency and smoother handling for the operator.

THE BROOMWADE AIR FORCE

includes Chipping, Caulking and Sealing Hammers for light and heavy duties; Riveters of all types, Portable and Stationary; Rotary Tools, including Drills, Grinders and Sanders; Air Motor Hoists and Winches.

We shall be pleased to supply fully descriptive literature on these and other pneumatic tools upon receipt of your request.

"BROOMWADE"

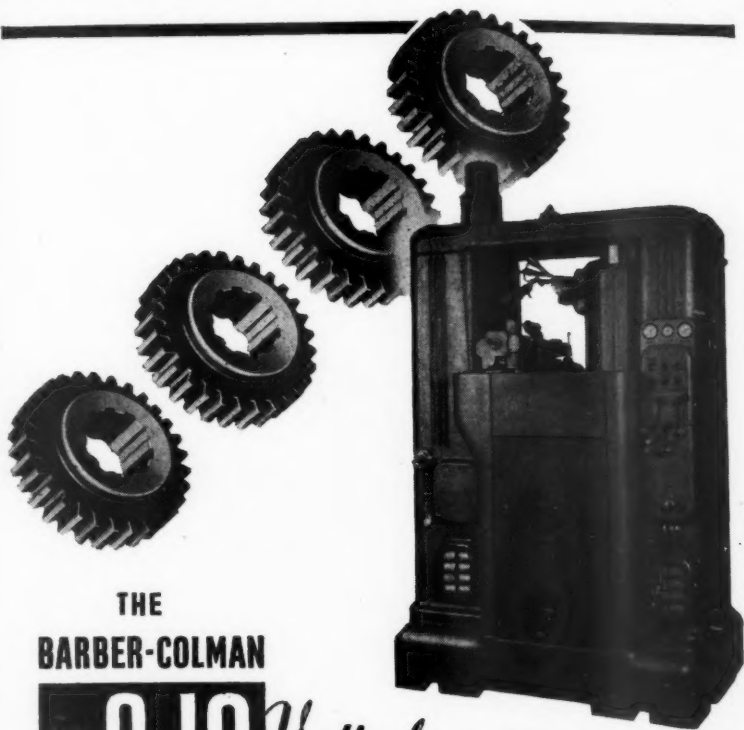
Pneumatic Equipment for all purposes

BROOM & WADE LIMITED,
HIGH WYCOMBE BUCKS.

Telephone: High Wycombe 1630 (8 lines)

CONSISTENT ACCURACY WITH HIGH OUTPUT

• • • • is the primary advantage offered by the Barber-Colman 8-10 Vertical Hobber. This machine has a capacity of 8" diameter by 10" long and is designed for high speed production of spur and helical gears or splines. Extra heavy, rigid structure plus the accurate mounting of the hob on the tapered hob spindle ensures consistent accuracy while the machine maintains a high output. Simple centralized control is effected by "push button." A lever sets in motion the semi-automatic cycle, while a simple selector regulates the "8-10" to either climb or conventional cutting. Increases in hob life ranging up to 50% are achieved by fitting the new Barber-Colman 8-10 hob shifter.



THE
BARBER-COLMAN

NO **8-10** *Vertical* HOBGING MACHINE

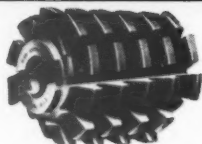
BARBER & COLMAN LTD., MARSLAND RD., BROOKLANDS, MANCHESTER
Telephone : SALE 2277 (3 lines)

Telegrams : "BARCOL," SALE

ENGINEERS SMALL TOOLS



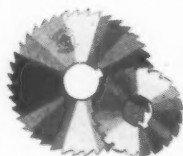
MILLING CUTTERS



HOBS & FORM CUTTERS



REAMERS & DRILLS



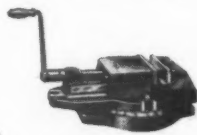
SAWS



DRILL CHUCKS



OIL & SUDS PUMPS



MACHINE VICES



STANDARD AND

"CARDINAL" BLADED MILLING CUTTERS
 "CARDINAL" INSERTED BLADE FACING
 HEADS • "CARDINAL" DRILL CHUCKS 3 JAW
 "CARDINAL" RAPID SLIP DRILL CHUCKS
 "CARDINAL" TAPPING ATTACHMENTS
 "CARDINAL" GEAR PUMPS FOR SUDS &
 OIL • "CARDINAL" MACHINE VICES
 "CARDINAL" COUNTERBORING SETS

SPECIAL TOOLS

HIGH SPEED STEEL MILLING CUTTERS
 INCLUDING SIDE & FACE CUTTERS, FACING
 CUTTERS, SHELL END MILLS, ANGLE CUTTERS,
 HOLLOW MILLS, GEAR CUTTERS, END MILLING
 CUTTERS, HOBS & FORM CUTTERS • REAMERS
 —SOLID & ADJUSTABLE • TWIST DRILLS
 COUNTERBORES, JIGS & FIXTURES

THE BROOKE TOOL

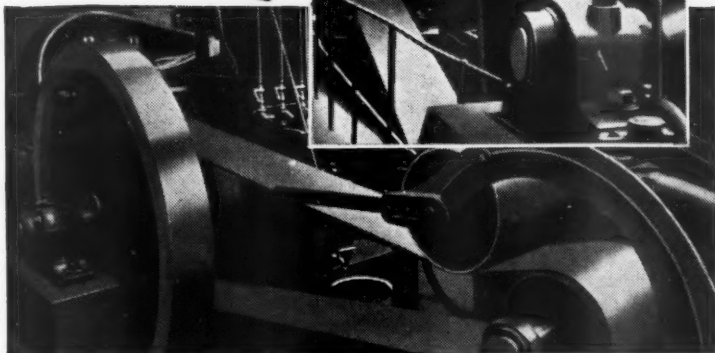
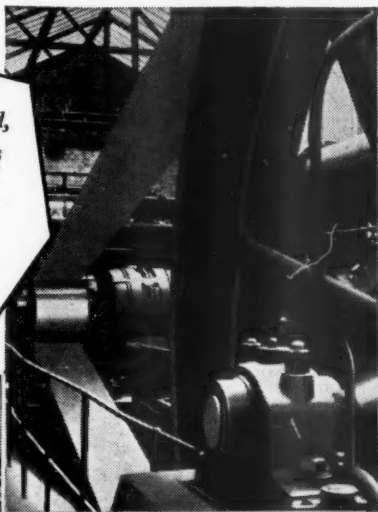
MANUFACTURING COMPANY LIMITED

WARWICK ROAD • GREET BIRMINGHAM 11 • Phone Victoria 2323



HIGH TEST TRANSMISSION BELTING

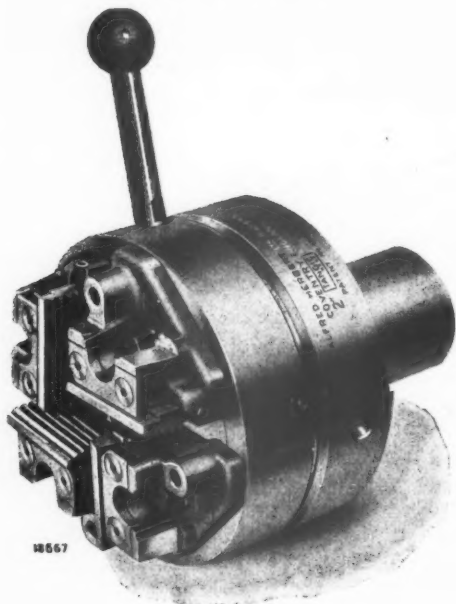
for every problem of speed,
power and severe conditions
... specify B.T.R. High Test
the 'belt that needs no rest'
The **FIRST** friction-surface
belting and still unrivalled in
material, construction and per-
formance



BRITISH TYRE & RUBBER CO. LTD.,
HERGA HOUSE, VINCENT SQUARE, LONDON, S.W.1



HERBERT



TANGIC THE SUPER DIEHEAD

4 Sizes - 9/16", 3/4", 1 1/4", 2".

Hardened and ground throughout.

Roughing and finishing attachment.

Cuts right and left hand threads (except 9/16" size).

Cuts threads of accurate pitch.

Chasers ground and set very rapidly.

Uses special long-life tangential chasers, a separate set for each diameter and pitch.

Cut short threads much beyond the rated capacity of the Diehead by using oversize chaser holders.

Deliveries:— 9/16", 3/4", 1 1/4", in stock; 2", 6 weeks

ALFRED HERBERT LTD · COVENTRY

**HERBERT**

THE SIGMA COMPARATOR AND QUALITY CONTROL



The Sigma Comparator, a highly accurate, sensitive and robust instrument, can now be provided with simple fixtures which enable the machine operator to check all essential dimensions of a part on ONE instrument without resetting.

He can therefore control quality during machining, pending 100% inspection on the Sigma Multi-Dimension Inspection machine.

Full particulars on request.

**PROMPT
DELIVERY**

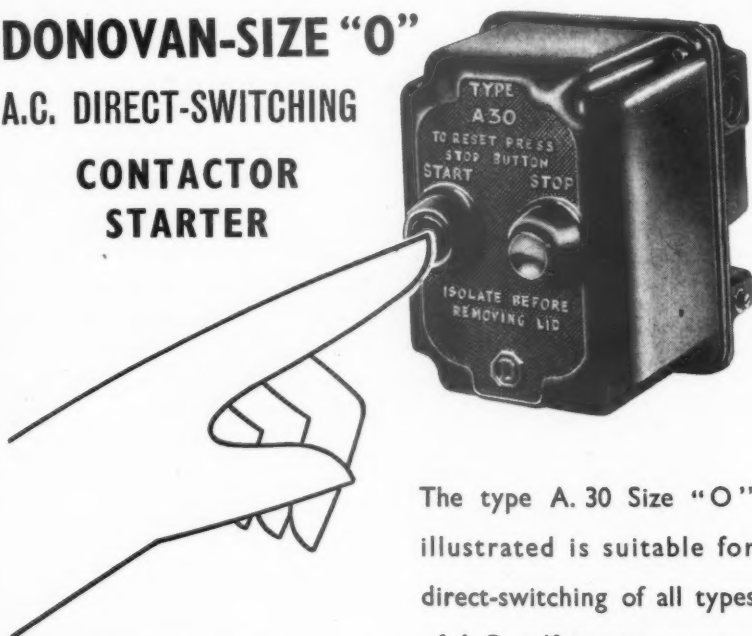
Sole Agents :— United Kingdom & Eire :

ALFRED HERBERT LTD · COVENTRY

DONOVAN-SIZE "O"

A.C. DIRECT-SWITCHING

CONTACTOR STARTER



- *Magnetically-operated with undervoltage Release & 3 o.c.r.*
- *Silver Faced Contacts*
- *Suitable for direct control from Start & Stop pushbuttons in lid*
- *Solenoid construction gives magnet quick & Positive action in opening & closing*

The type A. 30 Size "O" illustrated is suitable for direct-switching of all types of A.C. self-starting motors. It will appeal to Machine Tool Makers who require a starter of compact design and reliability in operation.

DONOVANS

THE DONOVAN ELECTRICAL CO. LTD.
BIRMINGHAM 9
Phone - STECHFORD 2277 (P.B.X.)

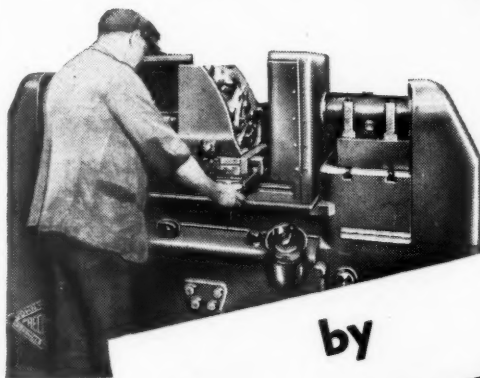
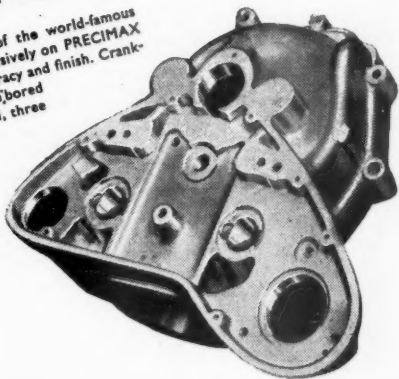


ELECTRICAL ENGINEERS AND
STOCKHOLDERS
CRAMS - "DONOVAN, BIRMINGHAM"

fine bored

Associated Motor Cycles Ltd., London, builders of the world-famous "A.J.S." and "Matchless" motor cycles rely extensively on PRECIMAX machines to maintain the highest standards of accuracy and finish. Crankcases for a twin cylinder engine, for instance, are fine bored on a Model F.B.2 machine. Six holes are finished, three in each side of the crankcase and very fine limits are consistently held.

We build these machines with from one to twelve spindles and will gladly send you full details on request.

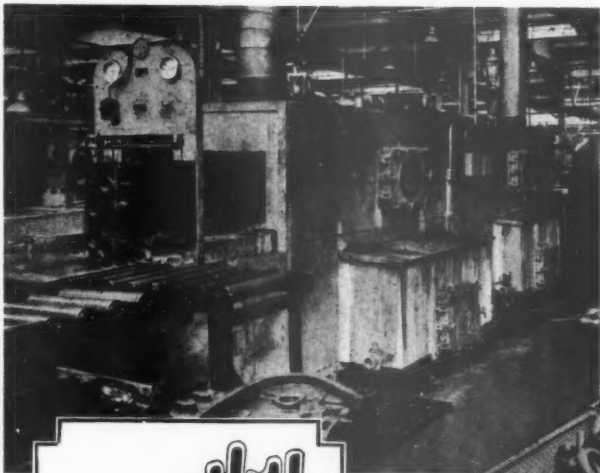


Note that Associated Motor Cycles Ltd. use PRECIMAX grinders on such components as crankshafts, fork tubes etc. Catalogues on request.

by
PRECIMAX

JOHN LUND, LTD., CROSSHILLS, KEIGHLEY, YORKS.

Each cleaning problem studied individually

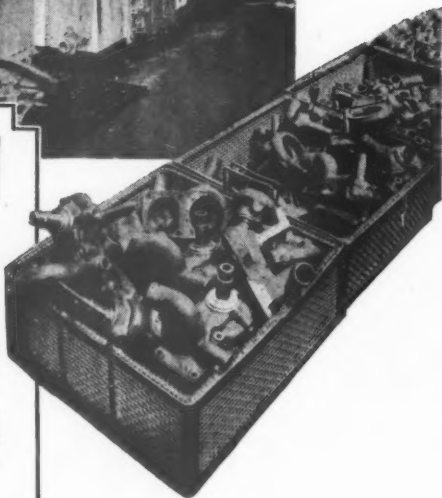


Bratby

**INDUSTRIAL
CLEANING
MACHINES**

This illustration shows
a machine cleaning
crank cases in the pro-
duction line.

It is equally capable of
cleaning small parts in
baskets.



Photographs by courtesy of "Machinery."

Sole Agents for Great Britain :

GEO. H. HALES MACHINE TOOL CO. LTD., Victor House, 1, Baker St., LONDON, W.1

Designed and manufactured by :

BRATBY & HINCHLIFFE LTD., SANDFORD STREET, ANCOATS, MANCHESTER 4



Finishing a pressure die casting made with MAZAK Alloy is a much simpler business than turning the demon of St. Ethelwulfa's into the debutante of Eaton Square. One of the outstanding qualities of MAZAK castings is the clean smoothness of surface so important to economical and successful finishing—whether by electro-plating, enamelling, Cronak treatment or any other process.

Because the basis of MAZAK is 'Crown Special' zinc of 99.99+ % purity, the objections to early die casting alloys have been overcome. Inter-crystalline corrosion—which causes distortion and disintegration—has been banished. Every batch of MAZAK is spectrographically examined for purity and composition.

Other advantages of MAZAK include high tensile strength; high impact strength; dimensional stability; durability; ductility; suitability for complex shapes and thin sections; and high corrosion-resistance. Above all, MAZAK provides the optimum combination of these qualities.

When such qualities are essential to die castings, use or specify MAZAK Alloy.

MAZAK

IMPERIAL SMELTING CORPORATION (SALES) LTD. 37 DOVER STREET. LONDON W.1

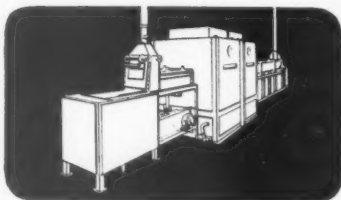
how would you make this?



Would you use one of the complicated methods — casting, forging, welding, riveting or torch brazing—with its attendant cost and production problems?

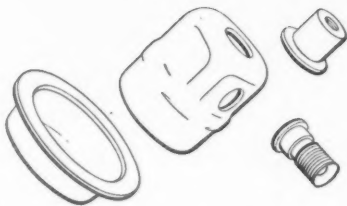
Or would you use the Birlec automatic copper brazing process by which an assembly of cheaply-produced pressings and capstan products becomes a finished component in a single, automatic furnace treatment?

With Birlec continuous brazing furnaces — needing only unskilled labour for the initial assembly operation — components, such as the filter body illustrated, are produced with clean finish, material saving, great strength and low cost. No other method possesses all these advantages.



Write for descriptive literature.

These illustrations show the two steel pressings and the two capstan products which are copper brazed together, in one operation, to form the complete filter body.



BIRLEC LTD • ERDINGTON • BIRMINGHAM 24

In Australia: Birlec Limited, Sydney, N.S.W. In Sweden: Birlec-Elektrougnar AB, Stockholm

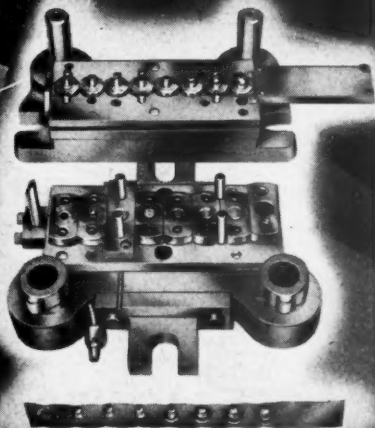

Prolite
**IN THE
PRESS SHOP**


*The Press
and
The Tool*

The fitting of "Prolite" Dies to this eight stage Press Tool has ensured that extra long run required by every Production Engineer.

Consult our Technical staff on your Tungsten Carbide Die problems and be sure of obtaining the best results from your tools.

Telephone : EUston 5666 & 6929



The "PROLITE" range includes :—

- Tungsten Carbide Tips and Tipped Tools.
- Die Pellets and Dies for All Purposes.
- Wear Resisting Parts.
- Tungsten and Molybdenum Rod, Wire, Sheet and Strip.

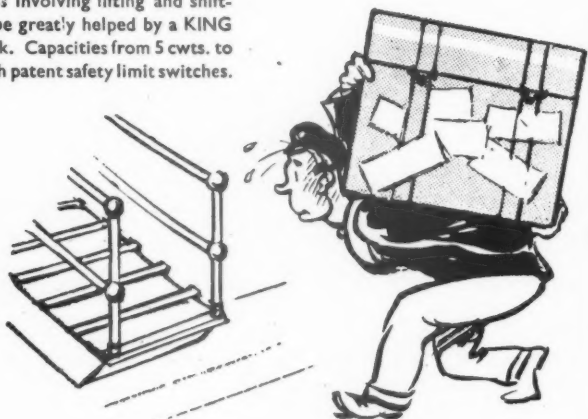
PROTOLITE LIMITED

(A subsidiary company of Murex Ltd., Rainham, Essex)

CENTRAL HOUSE, UPPER WOBURN PLACE, LONDON, W.C.1

HEY! / LIFT IT BY KING

KING Electric Chain Pulley Blocks save time and effort and speed up output. This means more production and bigger profits. There is scarcely any process involving lifting and shifting which cannot be greatly helped by a KING Electric Pulley Block. Capacities from 5 cwts. to 10 tons all fitted with patent safety limit switches.



NEW! With the introduction of the latest KING Marvex Model Electric Block, an attractive 12-page booklet is published. This gives full information about KING Blocks and many details covering the problem of lifting. The booklet is profusely illustrated and a copy will gladly be sent on request. Ask for L.S.49.

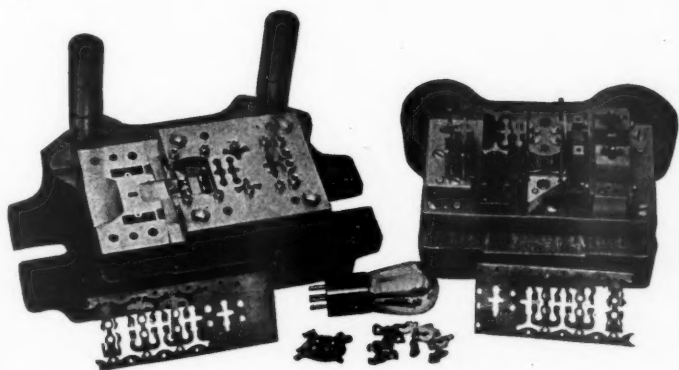
GEO. W. KING LTD.

MAKERS OF ELECTRIC PULLEY BLOCKS, CRANES AND CONVEYORS. WRITE FOR ILLUSTRATED BOOKLETS.

P.B.B. WORKS, HITCHIN, HERTS

PRESS TOOLS

LARGE OR SMALL



We are SPECIALISTS in the
DESIGN and MANUFACTURE
of SIMPLE, COMPOUND, SUB-
PRESS, and FOLLOW-ON TOOLS

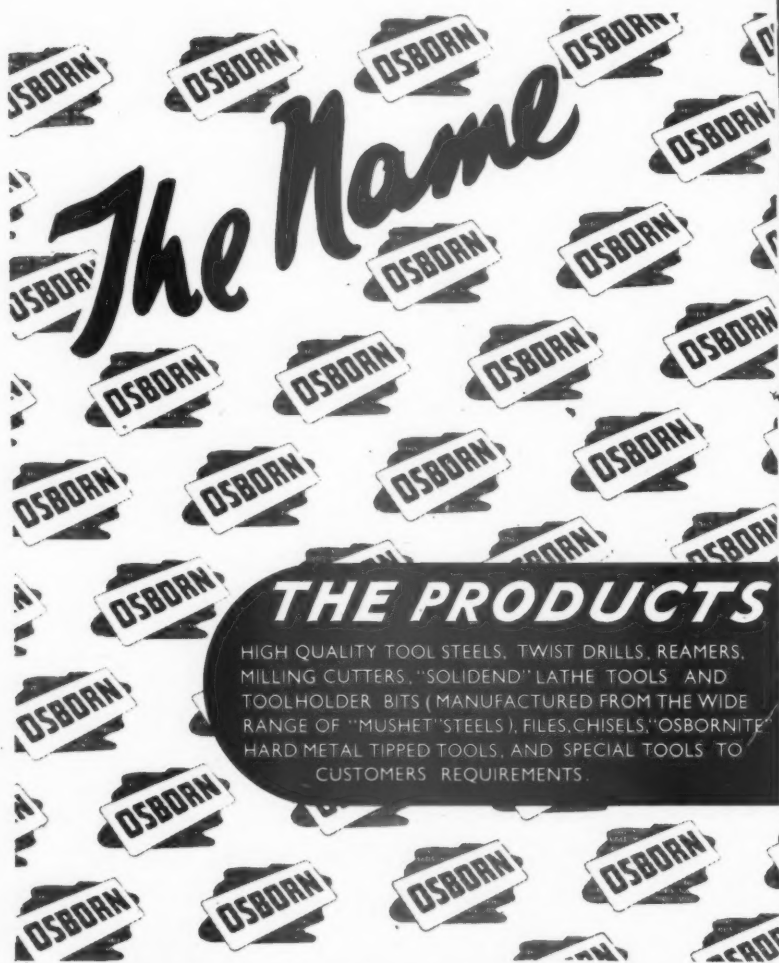
ARNOTT & HARRISON LTD.

(Member of the Gauge & Tool Makers Association)

**22, Hythe Road
WILLESDEN**

Telephone: LADbroke 3484-5-6



The background of the advertisement is a repeating pattern of the Osborn logo. Each logo consists of the word "OSBORN" in a bold, sans-serif font, enclosed within a stylized, cloud-like or speech-bubble-like border. The logos are arranged in a staggered grid across the entire page.

The Name

THE PRODUCTS

HIGH QUALITY TOOL STEELS, TWIST DRILLS, REAMERS, MILLING CUTTERS, "SOLIDEND" LATHE TOOLS AND TOOLHOLDER BITS (MANUFACTURED FROM THE WIDE RANGE OF "MUSHET" STEELS), FILES, CHISELS, "OSBORNITE" HARD METAL TIPPED TOOLS, AND SPECIAL TOOLS TO CUSTOMERS' REQUIREMENTS.



SAMUEL OSBORN & CO., LIMITED

CLYDE STEEL WORKS

SHEFFIELD

TELEPHONE 22 041



Excuse our enthusiasm
but to us
these
parts
are greater
than
this whole



ZINC CAN HELP in form room as well as factory. Thus it contributes essential parts to this globe,* produced in large quantities for home and export markets.

Why the parts are zinc alloy die cast

The pivots on which the globe revolves are die cast in zinc alloy (and would that world affairs went round as smoothly as this globe!) The thin meridian, too, is zinc alloy die cast, because zinc alloy is specially suitable for casting very thin sections, and the meridian can be made with raised degrees of latitude cast on it. Finally, the base is a zinc alloy die casting. The globe is made in $1\frac{1}{2}$ in. diameter (with other sizes to follow) and die cast parts are given a gilt finish.

Other educational uses

Zinc alloy die casting is also used for minutely accurate quantity production of microscope frames, projector parts, lantern parts, epidiascope parts, film viewers and drawing instruments.

Some facts about zinc alloy die casting

Speed is the essence of the die casting process — the shortest distance between

raw material and finished product. Zinc alloys are the most widely used metals for die casting because they ensure:

STRENGTH: Good mechanical properties for stressed components.

ACCURACY: Castings can be made practically to finished dimensions and need little or no machining.

STABILITY: Close tolerances are maintained throughout the life of the casting.

Hence the widespread war-time use of zinc alloy die casting for fuses, gun sights, periscopes, tank carburettors, etc.

British Standard 1004

Alloys conforming to B.S.1004 should be specified where strength, accuracy and stability are essential.

ZADCA

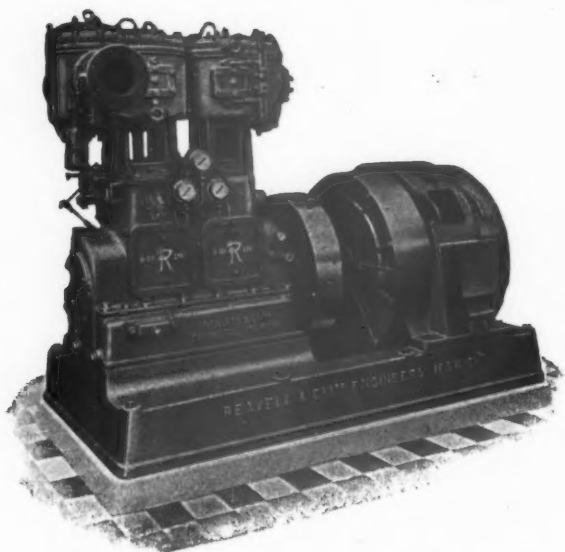
ZINC ALLOY DIE CASTERS ASSOCIATION
LINCOLN HOUSE, TURL STREET, OXFORD.
TELEPHONE: OXFORD 48088.

ZINC ALLOY DIE CASTINGS PLAY AN IMPORTANT PART IN THE EXPORT MARKET

Enquiries about the uses of zinc alloy die castings are welcome. Publications and a list of Members will be sent on request.

* Photograph by courtesy of George Philip & Son, Ltd.

AIR COMPRESSORS



We have standard types for all capacities and pressures and can supply the most efficient and reliable machine for any duty.

REAVELL & CO. LTD. - IPSWICH

Telegrams: "Reavell, Ipswich."

Telephone Nos. 2124-5-6

Let's have a
CUT *at it!*



If you have an inspired moulding idea that seems impossible, don't dismiss it right away. Get in touch with us and we'll "have a cut at it" by injection moulding. The



more difficult it is, the more we like it!

QUOTATION BY RETURN POST

You can rely on
PUNFIELD & BARSTOW
(Mouldings) Ltd.

BASIL WORKS, WESTMORELAND ROAD, QUEENSBURY, LONDON, N.W.9
'Phone : COLindale 7160 & 7956.

'Grams : "Punfibars, Hyde, London."

SOME OF OUR SATISFIED CLIENTS

Aladdin Industries Ltd.
Champion Electric Corporation
Crystal Products Ltd.
Decca Navigator Co. Ltd.
General Electric Co. Ltd.
Lightning Fasteners Ltd.
Newey Bros. Ltd.
Plessey Co. Ltd.
Pye Ltd.
Reeves & Sons Ltd.
Simmonds Aerocessories Ltd.
Slazengers Ltd.
S. Smith & Sons (England) Ltd.
Wilmot-Breedon Ltd.
Yard-o-led Pencil Co. Ltd.

FOR INJECTION MOULDINGS



Cutting up Rough !

Roughing or finishing : Deloro Stellite takes everything in its stride. Neither a carbide nor H.S.S. but combining the best qualities of both and at a reasonable price

Would the tools you are using now stand up to the operation shown above, in the works of

George Richards & Co. Ltd., Broadheath, Manchester.

The machine is facing the underside of a large boring machine table, cast iron, 4 feet square.

Depth of cut is $\frac{5}{8}$ in., feed 0.133 in. per rev. and speed of table 110 ft./min.

DELORO STELLITE LIMITED, HIGHLANDS ROAD, SHIRLEY, BIRMINGHAM
 TELEPHONE : SOLIHULL 2254/6 TELEGRAMS : STELLITE, BIRMINGHAM

★ "Stellite" tipped tools ★ tool bits ★ tool tips ★ milling cutter
 blades ★ hardfacing rods ★ workrests ★ precision castings.

Dawson Metal Parts

CLEANING & DEGREASING MACHINES



Extract from "The Factory Manager"

A bad bottleneck was cleared by the installation of Dawson washing plant for cleaning all components in process. Working a three-man team on day and night shift they found the paraffin spray-booth system inefficient, and unhealthy, there was, moreover, frequently a backlog of work piling up. The Dawson washers are expensive, but the savings they effect are remarkable. The night shift has been eliminated on this job; degreasing, hot rinsing and drying of all components manufactured on both shifts is now completed by day. The backlog was cleaned up by one machine on the first day of installation. Saving of time is conservatively estimated at 200 per cent on this 'mucky' but essential operation.


Manufactured by

DAWSON BROS. LTD., GOMERSAL, LEEDS

Sole Distributors & Consultants

DRUMMOND-ASQUITH (SALES) LTD
KING EDWARD HOUSE, NEW ST., BIRMINGHAM

Telephone : MIDLAND 3431-2-3




"Give us a lift"

A call frequently heard in workshops means a loss of output when the other man leaves his job.

MARTON AIR HOISTS

Make this call unnecessary and provide the ideal means of handling and positioning loads precisely from one cwt. upwards speedily, safely and economically.



Give PRODUCTION a lift

WITH
MARTON AIR HOISTS

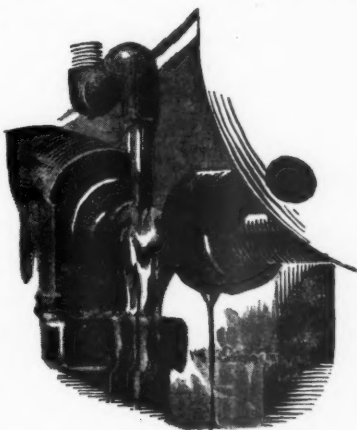
MARTON AIR EQUIPMENT
14, PARKSHOT • RICHMOND • SURREY • ENGLAND
RICHMOND 3348

'Swift' to the rescue when cutting tough steel . . .

A blend of pure fatty oil (for lubrication), mineral oil (for limpidity) and chemically combined sulphur for film strength, SWIFT straight cutting oil is ideal for tooling really tough materials which tend to tug and tear unless the correct oil is present.

If you have any trouble with machining highly alloyed high-tensile steels, there is a SWIFT oil which resolves your difficulties.

SWIFT No. 3 is applied for the most arduous jobs, is non-smoking when fed in correct volume for heavy-duty machining, the sulphur incorporation enabling the film to resist high tool pressures. SWIFT No. 6 is of lower viscosity, and is widely used for automatics, thread millers and medium duty work. SWIFT No. 12 is the grade for utmost economy in not-too-exacting repetition work. Finally, there is SWIFT Base for those who wish to blend to their own requirements.



Already entrusted with much of the tooling in the large engineering shops, SWIFT in the appropriate grade is invaluable to the machinist wherever finish ranks high and tool wear needs effective counter measures.

Had your copy of 'Cutting Fluids' yet?

NUMBER THREE
NUMBER SIX

SWIFT

NUMBER TWELVE
AND BASE

Sulphurised Cutting Oil

*Cutting
Fluids by*
**FLETCHER
MILLER LTD**

HEAD OFFICE & WORKS

HYDE Nr. MANCHESTER ENGLAND

Phone: HYDE 781 (5 lines) Grams: EMULSION, HYDE

SOUTHERN WORKS

SILVERDALE ROAD, HAYES, MIDDLESEX

MIDLAND WORKS

BILHAY STREET, WEST BROMWICH, S. STAFFS

CF16

There's a grand job 

Yes — any craftsman will say that of "Pryor" steel type. He will give you the reasons too — precision engraved, carefully controlled heat treatment, absolutely interchangeable with uniformity of impression in six stock sizes — a fine product which inspires fine workmanship.

PRYOR
MARKING DEVICES

EDWARD PRYOR & SON LTD. BROOM ST. SHEFFIELD



NON-FERROUS CASTINGS

Our specialised knowledge is offered to you in the supply of Castings from a few ounces up to 5 tons—in

**PHOSPHOR BRONZE
GUNMETAL
MANGANESE BRONZE
ALUMINIUM BRONZE**

(Tensile Strength 45 tons per sq. in.)

ALSO

Light Alloy Castings · 'BIRSO' Chill-Cast Rods and Tubes Centrifugally-Cast Worm-Wheel Blanks · Ingot Metals Phosphor Copper · Phosphor Tin · Precision Machined Parts Finished Propellers Etc.

Fully approved by Admiralty and A.I.D.

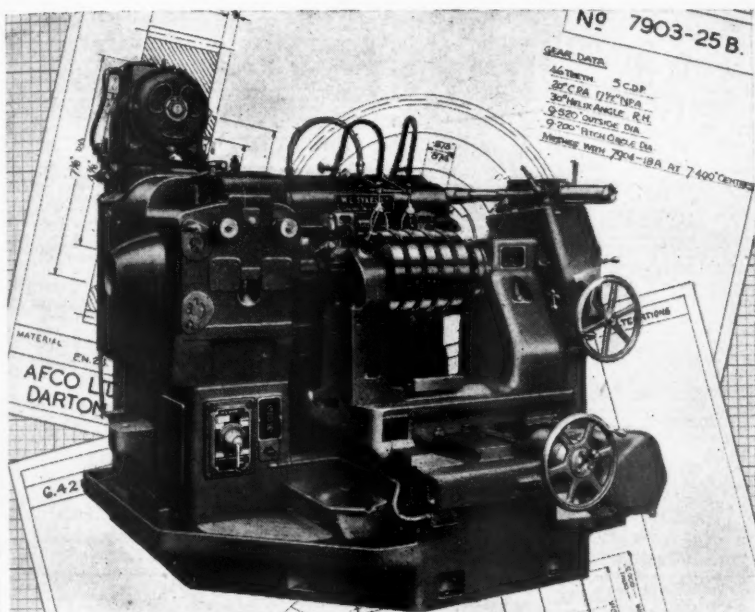
B108b

T. M. BIRKETT & SONS, LTD.
HANLEY · STAFFS.

Phone: Stoke-on-Trent 2184-5-6
Grams: Birkett, Hanley

in association with **BILLINGTON & NEWTON LTD.**
LONGPORT · STAFFS.

Phone: Stoke-on-Trent 87303-4 & 88147
Grams: Bronze, Phone, Longport

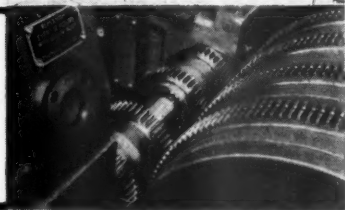


FOR GEAR PRODUCTION



GEAR GENERATING MACHINES

Sykes Multi-cutter Gear Generating Machines are designed to combine economy with quality. The Machine illustrated is the Type 3C., shown cutting eight Automobile Starter Rings simultaneously, using four cutters.



W. E. SYKES LTD · MANOR WORKS · STAINES · MIDDLESEX · TELEPHONE STAINES 978 0 · TELEGRAMS SKUTTER STAINES

W. E. LTD.
DENTON
SURREY

EN 36
SYKES

**For Smooth, Quiet
Efficiency**

SPURS

SPIRALS

SPROCKETS

WORMS

HELICALS

**STRAIGHT
BEVELS**

**SPIRAL
BEVELS**

**WORM
WHEELS**

**Strength
and Durability**

THE MOTOR GEAR & ENGINEERING CO. LTD.

ESSEX AND CORONA WORKS • CHADWELL HEATH • ESSEX • Phone: Seven Kings 3456

**STOP
WATCHES**



For time and motion study, process control, production timing, and for a host of other occasions, a Stop Watch can give invaluable aid, but it must be accurate to a fine degree.

Stop Watches can be supplied in several standard patterns and also calibrated for special purposes; and all are backed by a comprehensive repair service. Each watch is individually examined and checked against a standard Chronoscope before despatch, and is guaranteed for 12 months.

For over a century and a half, Camerer Cuss have been renowned for accurate time-keepers of all kinds, clocks and watches.



Write for
Illustrated
Catalogue.

CAMERER CUSS

Makers of Good Clocks & Watches since 1788

NEW OXFORD STREET · LONDON · W.C.1

Also 91 Kingsway, W.C.2

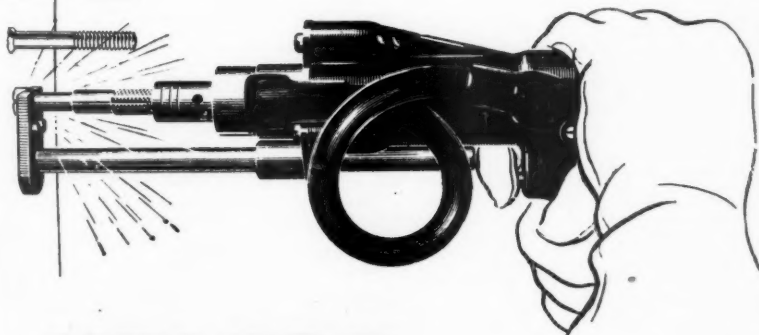
**FOR
TIME
AND
MOTION
STUDY**

Weld 14 studs *while* *drilling and tapping 1*

How do you fix studs to steel? By drilling and tapping, the old slow expensive way, or by Nelson stud welding, the way that's 14 times faster? It's done with a gun; easy to handle, absolutely safe, almost entirely automatic and powered by a D.C. generator. Just load the gun, hold it in place, then press the trigger, and the equipment does the rest. It cuts costs, saves time and makes every weld precise and uniform.

Nelson flux filled studs are one of the reasons for precision performance. They are made from specially chosen steel, end-loaded with a special flux mixture and sealed over like a cartridge.

If you have a job of fastening to steel send for the Nelson Brochure today.



NELSON

STUD WELDING SERVICE

CROMPTON PARKINSON LTD., PLANT DIV.
CROMPTON HOUSE, ALDWYCH, W.C.2.

Perfect Angle Control

The exclusive Abwood Chip Breaker Grooving attachment . . . constant centre height to grinding point at all angles . . . these are only two features of the Abwood Concentre Machine. A Precision Machine for grinding and lapping Carbide tipped tools or accurate grinding of high speed steel tools, with perfect angle control.



THE ABWOOD 'CONCENTRE' CARBIDE TOOL GRINDER

THE ABWOOD TOOL & ENGINEERING CO. LTD. Princes Road, Dartford, Kent. Tel.: Dartford 2258/9

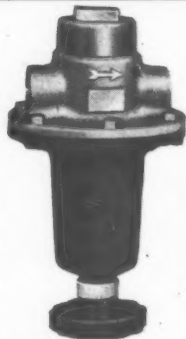
PRESSURE REDUCING VALVES

Designed and produced by experts, these valves give a maximum flow with immediate sensitive pressure control and minimum sympathetic drop with variations of upstream pressure.

No glands, no sticking or chattering, readily accessible. Well-made and perfectly balanced these valves give excellent service under all conditions.

Please state purpose of valve when ordering.

Guaranteed for 12 months.



WILLIAMS & JAMES

(ENGINEERS) LIMITED

GLOUCESTER

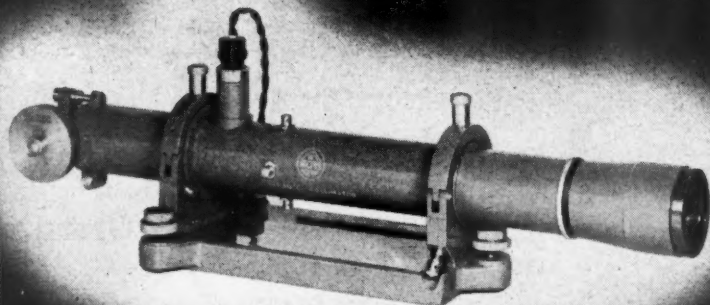
ENGLAND

TELEPHONE:



24021 (2 LINES)

WATTS *Microptic* AUTO-COLLIMATOR



A precision instrument with direct reading to 0.5 second over a range of 10 minutes. With Watts Microptic Auto-Collimator, used in conjunction with an optical reflector, small angular and linear displacements can be measured more conveniently than by conventional mechanical methods; and to an accuracy of a fraction of a second of arc.

Full particulars will be supplied on request.

Write for List J.I.P.E./7.

HILGER & WATTS LIMITED

WATTS DIVISION,

48 ADDINGTON SQUARE, LONDON, S.E.5

Telephone: RODNEY 5441.

FOR RELIABLE METAL CASTINGS SPECIFY



REGISTERED TRADE MARK

The Technically Controlled Castings Group
18 ADAM STREET, LONDON, W.C.2.

LAKE & ELLIOT, LTD., BRAINTREE • SHOTTON BROS., LTD., OLDBURY
S. RUSSELL & SONS, LTD., LEICESTER • HENRY WALLWORK & CO., LTD., MANCHESTER
ALEX. SHANKS & SON, LTD., ARBROATH • JOHN WILLIAMS & SONS (CARDIFF) LTD

ADAM *Complete* CAM SERVICE

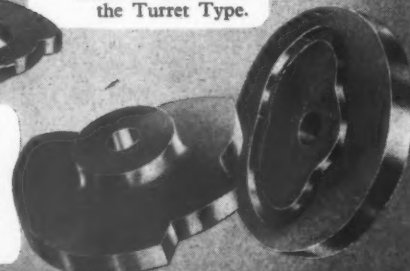


CAMS and TOOLS

At your command—
a Complete service
for all single spindle
Swiss-Type automatic
lathes as well as for
the Turret Type.

EDGE and GROOVE PLATE CAMS

Also contour profiling
on small arms details,
aero-engine compo-
nents, etc.



ADAM *Machine Tool Company Limited*
ACHE WORKS • WAVERLEY ROAD • ST. ALBANS • HERTS
Telephone: St. Albans 95 Grams: Adamatic • St. Albans

TAYLOR 2767



FIT
HOOVER F.H.P. MOTORS

TRADE MARK

for smooth, trouble-free power

When you need Fractional H.P. Motors that will stand up to the hard test of constant daily usage—that will give years of smooth, efficient, trouble-free service—fit a “HOOVER”. These strong, sturdy motors have inherited the same dependability and

stamina that characterizes every product that carries the name of Hoover.

Wherever Hoover Motors are used to provide power in electrical appliances **INCREASED CUSTOMER SATISFACTION** is the inevitable result.

HOOVER LIMITED

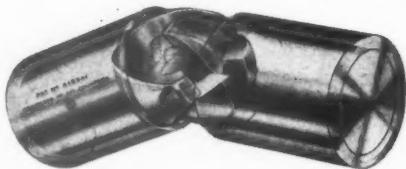
INDUSTRIAL PRODUCTS DEPT · PERIVALE · GREENFORD · MIDDLESEX



Patent UNIVERSAL BALL JOINTS

For all types of remote control, accessory drives, etc.
Efficiency 98% maximum, 92% minimum N.P.L. certified.
The lightest most compact joint made.

- ONLY THREE WORKING PARTS
- FORKS SOLID WITH JOINT HALVES
- HARDENED AND GROUND WORKING FACES
- LARGE BEARING SURFACES
- SHROUDED FORKS GIVE MINIMUM DEFLECTION
- 9 SIZES. BORED FOR SHAFTS RANGING FROM $\frac{1}{4}$ in. TO $1\frac{1}{2}$ in. DIAMETER



WE ALSO MANUFACTURE HOOKE'S TYPE UNIVERSAL JOINTS IN THE SAME RANGE OF SIZES

The

MOLLART
ENGINEERING CO. LTD.

PRECISION ENGINEERS
KINGSTON-BY-PASS
SURBITON · SURREY
ELMbridge 3352/3 4/5
Grams : Precision, Surrey



PRESS TOOLS

MOULDS

AND JIGS

Universal Tools LTD

TRAMWAY PATH
MITCHAM
SURREY

Phone : Mitcham 1624-5-6.



Galtona

GROUND THREAD TAPS

These taps are made to very close tolerance, and are ground from the solid after hardening, thus eliminating the risk of distortion. We now carry a large stock of standard taps — specials made to order. Supplied in high speed steel or alloy steel.

Richard Lloyd Limited

STEELHOUSE WORKS · OLIVER STREET · BIRMINGHAM 7

Telephone: Aiton Cross 3001 (2 Lines) · Telegrams: 'Taps, Birmingham'

Write for illustrated catalogue.

MEMBERS OF THE GAUGE AND TOOLMAKERS' ASSOCIATION

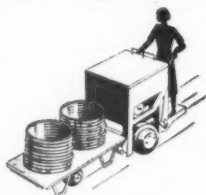
North of England Representative: A. V. Green, 50/51 Britannia House, Wellington St., Leeds

London Agent: J. O. Maddock, 13 Bayham Road, W.4

Well fed machines make willing workers



Avoid half-starved machines on the one hand and overfed congested machines on the other, by installing 'Electricars'—the speedy works haulage trucks. They save labour and release men for directly productive work. For full information about these cheap-to-run, easy-to-handle aids to production, write to Crompton Parkinson Ltd., Crompton House, Aldwych, W.C.2. Telephone : CHAncery 3333.



ELECTRICARS

increase productivity

PETCO

**INVITE YOU to
Have waste solvents tested Now!**



We put at your disposal, the most competent industrial chemists, backed by a fully equipped laboratory, that are available to the industry today. Send us a small (one gallon) sample of your waste solvent, together with the fullest information of its composition and weekly quantity available for recovery. In the matter of a few days, we will advise you, without obligation, exactly what we can do to solve your waste recovery problem.

Manufacturers of the Amazing
SOLVENT RE-REFINER

OUTPUT OF ABOUT 9 GALLONS PER HOUR at 3^d PER GALLON


also the **NEW Vapour DEGREASER**

**PETROLEUM
ENGINEERING
& TRADING CO. LTD**
GRAFTON STREET
HIGH WYCOMBE-Bucks
Tel. HIGH WYCOMBE 130

UNIVERSAL

TOOL HEADS

*effect big savings
on tool costs*

Model 'O' — Range of Bore $\frac{3}{16}$ " - $1\frac{1}{2}$ "Model 'I' — Range of Bore $\frac{1}{2}$ " - 2"


Boring, Turning, Facing, Back-facing, etc. can be carried out by this head without the use of any special tools whatsoever. Saves the cost of large or special tools on the occasional job. Cut on the boring tool can be applied without stopping the spindle of the machine. This feature not only saves time but ensures constant boring speed and feed resulting in closer accuracy. Supplied in special case with full range of cutters, etc.

Illustrated leaflet with pleasure on request.

Your Enquiries are invited

NEWALL GROUP SALES LTD

Tel. Peterborough 3227 & 9

PETERBOROUGH

Sole Selling Agents for Scotland: John S. Young & Co. Ltd., 257-261 Eglinton Street, Glasgow, C.5
 Sole Agent for Midland area: Stanley Howard, Ltd., 75-76 Exchange Blds, Stephenson Place, B'ghm, 2

Automatic Feeds for any Press

CONSULT

HUMPHRIS

THE PRESS EXPERTS

HUMPHRIS AND SONS LTD · 94 PARK ROAD · PARKSTONE · DORSET

14461A

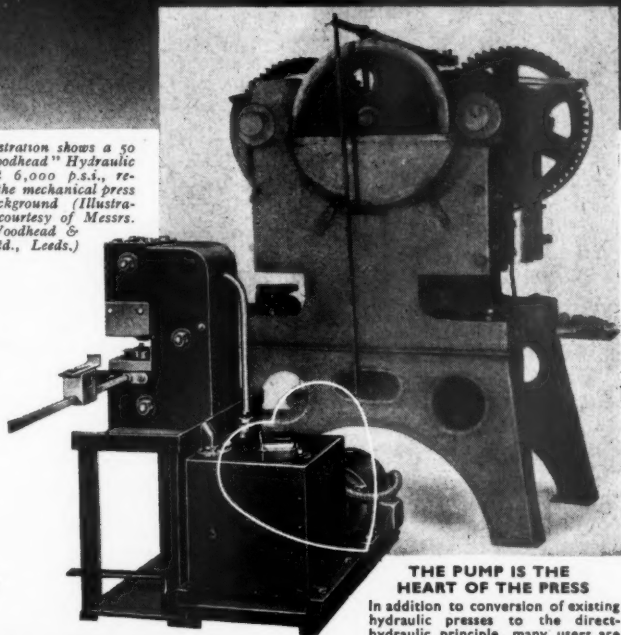
FLAME HARDENING
BY THE
SHORTER
PROCESS

We invite you to—
WRITE FOR
OUR 32 PAGE
BOOKLET

FLAME HARDENERS LTD
"SHORTER WORKS" BAILEY LANE SHEFFIELD.I.
TEL SHEFFIELD 21627

REPLACEMENT OF MECHANICAL PRESSES BY DIRECT-HYDRAULIC SYSTEM

The illustration shows a 50 ton "Woodhead" Hydraulic Press at 6,000 p.s.i., replacing the mechanical press in the background (Illustration by courtesy of Messrs. Jonas Woodhead & Sons Ltd., Leeds.)



THE PUMP IS THE HEART OF THE PRESS

In addition to conversion of existing hydraulic presses to the direct-hydraulic principle, many users are replacing mechanical presses. A direct-hydraulic press with "Electraulic" High-Speed Pump takes up much less space because the high pressure (up to 7,000 p.s.i.) enables it to be compact. Controlled pressure by a turn of a knob, unaffected by thickness of work or length of stroke. Unbreakable—cannot be overloaded.

ELECTRAULIC
HIGH SPEED
HYDRAULIC PUMPS

TOWLER BROTHERS (Patents) LTD., RODLEY, Nr. LEEDS

TR,22

For Gauges, Taps and
all Precision Tools.
Ensures maximum
degree of accuracy
after hardening.

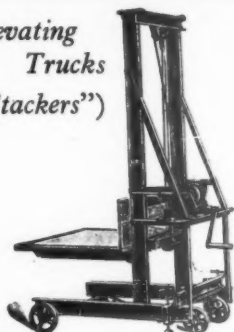
NON-SHRINK
PITHO
OIL-HARDENING
STEEL

Steel
Makers
since
1776.

SANDERSON BROTHERS & NEWBOULD LTD

SHEFFIELD ENGLAND

*Elevating
Trucks
("Stackers")*



Just two models selected from our current catalogue which illustrates almost 200 models of trucks, trolleys, lifting trucks and other labour-saving devices specially designed to meet your needs. A postcard will bring you a copy. Write TODAY to:

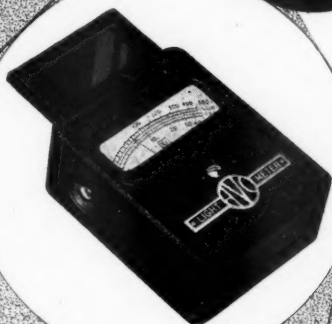


TYNE TRUCK & TROLLEY CO. LTD.

66/68 Northumberland Street, Newcastle-on-Tyne, 1

ARE YOU

*"In
the
Dark"* about
Light?



Eyestrain is generally the result of lighting conditions being unsuited to a particular kind of work. The inevitable outcome is inefficiency and loss of output, followed by absenteeism.

Deficiencies in lighting are indicated instantaneously and accurately by the "AVO" Light Meter, which provides the simplest means of testing adequacy of lighting conditions in shops, offices, factories, showrooms, schools, etc.

This pocket size photo-electric cell instrument gives direct readings in both foot candles and lux units. The scale, calibrated from 0.50 foot candles and 0.500 lux, is very open at the lower end, enabling readings as low as one foot candle to be read with rapidity and ease.

A switch multiplier increases the range to 250 foot candles and 2,500 lux.



LIGHT Meter

Size: $2\frac{1}{4}'' \times 2\frac{1}{8}'' \times 1\frac{1}{8}''$
Weight: 7 ozs.

Price
£6

The Instruction Book provided with the instrument contains lists of recommended illuminations for all kinds of interiors.

● Write for fully descriptive pamphlet to:

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
Winder House, Douglas Street, London, S.W.1. Telephone: VICTORIA 3404-9

INDEX TO ADVERTISEMENTS

	Page
Abwood Tool & Engineering Co. Ltd. ...	LXvii
Acheson Colloids, Ltd.	—
Adam Machine Tool Co., Ltd.	Lix
Ajax Machine Tool Co. Ltd.	—
Arnott & Harrison, Ltd.	XLiv
Automatic Coil Winder and Electrical Equip- ment Co. Ltd.	LXviii
Barber & Colman, Ltd.	xxxii
Benton & Stone, Ltd.	—
Birkett, T. M., & Sons, Ltd.	Liii
Birlec, Ltd.	XLi
Birmingham Aluminium Casting (1903) Co. Ltd.	—
Bratby & Hinchliffe, Ltd.	xxxix
British Steel Founders' Association	x
British Tyre & Rubber Co., Ltd.	xxxiv
Brooke Tool Manufacturing Co. Ltd., The ...	xxxiii
Broom & Wade Ltd.	xxxix
Bull Motors, Ltd.	—
Burton, Griffiths & Co. Ltd.	xv

Camerer Cuss & Co.	LV
Catmur Machine Tool Corporation, Ltd.	xxxix
Churchill, Charles & Co., Ltd.	—
Cincinnati Milling Machines, Ltd.	viii
Climax Rock Drill and Engineering Works, Ltd.	xii
Coventry Gauge & Tool Co., Ltd.	xviii
Craven Bros. (Manchester) Ltd.	—
Crompton Parkinson, Ltd.	Lvi, LXiii

Dawson Bros., Ltd.	L
Dean, Smith & Grace, Ltd.	xxix
De Havilland Aircraft Co. Ltd., The ...	—
Deloro Stellite Ltd.	XLix
Donovan Electrical Co., Ltd.	xxxvii
Drummond Bros., Ltd.	xvii

E.M.B. Co., Ltd.	—
English Electric Co. Ltd., The... ..	—
Exors. of James Mills, Ltd.	xiv

Fascol, Ltd.	—
Firth, Brown Tools Ltd.	—
Flame Hardeners Ltd.	LXv
Fletcher Miller Ltd.	Lii

Gill, Samuel & Sons (Engineers) Ltd.	xxv
Gledhill-Brook Time Recorders Ltd.	xxiv
G.P.A. Tools & Gauges, Ltd.	xxvii
Guylee, Frank, & Son, Ltd.	Inside Back Cover

Harris, John, Tools Ltd.	vi
Harrison, T. S., & Sons, Ltd.	—
Hendry, James, Ltd.	—
Herbert, Alfred, Ltd.	xxxv, xxxvi
Hilger & Watts, Ltd.	Lviii
Holman Bros. Ltd.	Back Cover
Hoover, Ltd.	Lx
Hordern, Mason & Edwards, Ltd.	—
Hughes, F. A., & Co., Ltd.	—
Humphris & Sons Ltd.	LXv

Imperial Smelting Corporation, (Sales) Ltd.	XL
--	----

Johansson, C. E., Ltd.	—
-----------------------------	---

Keelavite Rotary Pumps & Motors, Ltd.	xix
King, Geo. W., Ltd.	XLiii

Lang, John, & Sons, Ltd.	—
Linread, Ltd.	—
Lloyd, Richard, Ltd.	LXii
Lund, John, Ltd.	xxxviii

Marton Air Equipment Ltd.	Li
Mercer, Thos., Ltd.	xiii
Ministry of Fuel and Power	—
Moliart Engineering Co., Ltd.	Lxi
Moore & Wright (Sheffield) Ltd.	—
Morgan, George, Ltd.	—
Motor Gear & Engineering Co., Ltd.	LV
McKechnie Bros. Ltd.	—
Mycalex Co. Ltd., The ...	—

Newall, A. P., & Co., Ltd.	xi
Newall Group Sales Ltd.	LXiv
Norton Grinding Wheel Co., Ltd.	xxii

Osborn, Samuel & Co., Ltd.	XLv
---------------------------------	-----

Parkinson, J., & Son (Shipley) Ltd.	v
Parsons Chain Co. Ltd.	—
Petroleum Engineering & Trading Co., Ltd.	LXiii
Pitman, Sir Isaac, & Sons, Ltd.	—
Pitner Gauge & Precision Tool Co. Ltd.	—
Protolite, Ltd.	XLii
Pryor, Edward, & Son, Ltd.	Liii
Pultra, Ltd.	—
Punfield & Barstow (Mouldings) Ltd.	XLviii
Pyrene Co. Ltd., The ...	—

Quasi-Arc Co. Ltd., The ...	—
-----------------------------	---

Reavell & Co., Ltd.	XLvii
Remington Rand Ltd.	vii
Rockwell Machine Tool Co. Ltd.	—

Sanderson Bros. & Newbould, Ltd.	LXvii
Sheffield Twist Drill & Steel Co., Ltd., The ...	xxiii
Sterling Metals Ltd.	iii
Sunbeam Anti-Corrosives, Ltd.	xx
Swift, Geo., & Son, Ltd.	—
Sykes, W. E. Ltd.	Liv

Talbot-Stead Tube Co. Ltd.	—
Taylor & Jones, Ltd.	—
Technically Controlled Castings Group, The ...	Lix
Technaphot, Ltd.	—
Timbrell & Wright, Ltd.	—
Towler Bros. (Patents) Ltd.	LXvi
Triefus & Co. Ltd.	Inside Front Cover
Tyne Truck & Trolley Co. Ltd.	LXvii

Unbrako Socket Screw Co., Ltd.	—
Universal Tools, Ltd.	Lxi

Van Moppes & Sons (Diamond Tools) Ltd.	—
Vaughan, Edgar, & Co. Ltd.	xvi

Ward, H. W., & Co., Ltd.	iv
Ward, Thos., W., Ltd.	xxi
Wickman, A. C., Ltd.	ix, xxvi
Williams & James (Engineers) Ltd.	Lvii
Wild Barfield Electric Furnaces Ltd.	—
Wolverhampton Die Casting Co., Ltd.	xxviii

Zinc Alloy Die Casters Association ...	XLvi
--	------

Page

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

E

'ARCHER'

QUICK CHANGE COLLET CHUCK

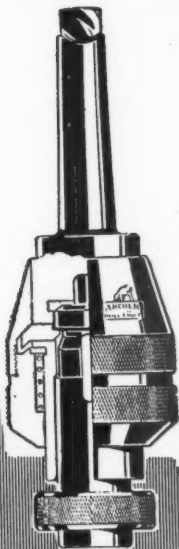
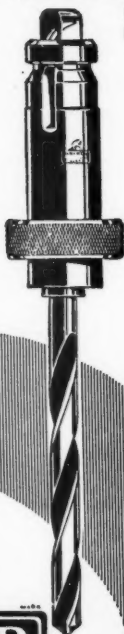
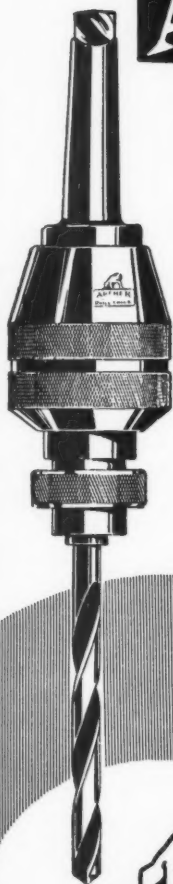
The Latest and Most Modern Quick Change Chuck
ONE HAND ACTION

NON-STOP change of tools in the quickest possible time. Positive drive from top of collet in direct spindle line. Safety collar on collet for operator's hands. All parts thoroughly hardened and accurately ground ensuring permanent concentricity and long life.

Free movement safety collar on collet protects hands from danger of revolving tool.

Write for Catalogue No. 120

HARDENED ALL OVER
PERMANENT CONCENTRICITY



ARCHER
SMALL-TOOLS

FRANK GUYLEE & SON

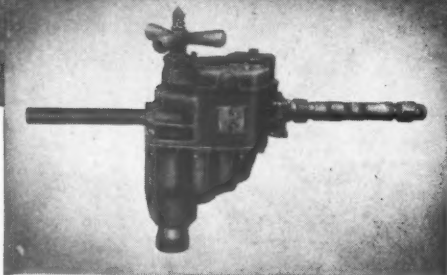
'ARCHER' TOOL WORKS,
MILLHOUSES · SHEFFIELD, 8

Ltd.

That's the drill!



(Above) Type 420R. Drilling capacity: $1\frac{1}{2}$ inches. Weight 34 lb. Length $13\frac{1}{2}$ inches.



(Inset) Type 870R. Drilling, reaming and tapping capacity: 3 inches. Weight: 54 lb. Length 20 inches.

A Holman Rotodrill is the sort of pneumatic tool which any skilled worker is glad to use. Every drill in the range is robust, compact, light in weight and sensitive but easy to handle. Each is powered by an efficient and economical vane-type air motor with a patented blade-pressure control system, and all models readily lend themselves to a variety of uses. Types available include all sizes of reversing and non-reversing screw-feed drills, hand-held drills and woodborers. Full details and specifications will be supplied on request.

*The first name
for lasting service*

BROS. LTD.
Holman
CAMBORNE, ENGLAND
TELEPHONE: CAMBORNE 2275 (7 LINES)
TELEGRAMS: AIRDRILL, CAMBORNE
SUBSIDIARY COMPANIES, BRANCHES &
AGENCIES THROUGHOUT THE WORLD

H.17

All communications regarding advertisements should be addressed to the Advertising Managers, T. G. Scott & Son, Ltd., Talbot House, 9, Arundel Street, London, W.C.2. Phone: Temple Bar 1942. Printed by Maxwell, Love & Co., Ltd., Bradley's Buildings, White Lion Street, London, N.1.

Iman

glad
sitive
-type
eadily
ersing
etails

D.
n
ND
INES)
ORNE
IES &
ORLD

agers.
1942.
N.I.